

DRAGON USER



The independent Dragon magazine

January 1988

Contents

Letters

2

Why high prices? ... range right, routine ...
close in Scandinavia ... convenient tech-
niques ... competition is useful.

News

4

Haris's new utility ... three from Dragons ...
improved Supersmooth power supply ...
September '88s offer ... new Hargrave
adventure.

Dragon soft

6

The Kings Quest and The Quest or the
Meaning of Life from Simon Hargrave.

Expert's Arcade Arena

7

Back from his travels, and still asking dif-
ficult questions ...

Introducing modems

8

A beginner's guide to modems, addres-
sations and what they talk about on the
telephone, by Ken G. Smith.

Crossword

9

Win a tape, no tiebreakers.

Pamcodes

10

Part D Arco teaches labelled branches in
her series on machine code for beginners.

Music Extender

12

David Meakin and eight pages of updates
for Music Master. See Stop Press.

Adventure Trail

20

Thamescot Peter Gerard ties up some Fairy
Business, pronounces on blackness and the
skewer and goes native on Xylog.

Write: ADVENTURE

22

It's getting dangerous in the dungeon. Even
saurians have to move around in gangs,
says Peter Gerard.

Down in the Dumps

24

A low-re dump for the Microtech D4188S.

Winners and losers

25

Calculating the answer to the August com-
petition, and how to test your accuracy.

Competition

26

Gordon Lee said to the numbers, go forth,
multiply and increase. And to the wretched
bug for the computer, Min Larkspur Wabber
is trapped from John Penn Software.

The Answer

27

Gordon Lee's solution to the October
competition.

Dragon Answers

28

No Amd pack for Dragons ... Maplin in-
jects ... slugs and fat wiles ... using binary
code!-decimal.

STOP PRESS • STOP PRESS • STOP PRESS •

Peter's three-adventure compilation is
£3.99 and £2.99 as advertised last
month. 'Taped listings of Music Extender
will be available from John Penn.

Editorial

LOOKING down the tunnel of another
year, I am going to quietly forget that
people keep asking "what's going to
happen to Dragon User?" and remem-
ber that people have been asking that
question since 1984 and, like the
Christmas turkey, we keep right on
reappearing.

I shall start worrying about that Great
Friscoes Fan in the Sky after Christ-
mas. Right now I am staying put under
the mistletoe. Happy Christmas!

Talking of mistletoe, I had the chance
to meet old and new acquaintances at the
1988 Show on Saturday and talk
things over. Many people agreed that
there are opportunities for marketing
Dragon software — for instance, pro-
ducing legitimate, less expensive conver-
sions of American Tandy programs —
which are not taken up because there is
a better living to be made from other
machines. On the contrary, dealers
who have good contact with Dragon
owners are gradually living off their
less profitable games to specialist
dealers who are more committed but
are inevitably smaller.

More information on reliable, good
value sources of software and hard-
ware from overseas would be welcom-
ed by everyone now.

Telephone number
(all departments)
4304343

Editor

HELEN ARMSTRONG

Production Editor
DRAGON EDITORIAL

Administration
CAROL RYTH

Advertisement Manager
DRAGON EDITORIAL

Marketing Manager
HELEN PERRY

Managing Editor
PETER KANE
Publishing Director
JIMMY IRELAND

Subscriptions

UK 144 for 12 issues
Overseas (airfreight) £26 for 12 issues
RSD 6285-77, Telex 266275
Dragon User, 1010 Little Newport Street,
London WC2H 9PP

US address: via Business Press International,
200 East 12nd St, New York, NY 10017
Published by Seal Press Ltd
© Seal Press 1987

Typesetting and Production by Arnel Limited,
London W6U.

Printed by Hestley Brothers Ltd, Ashford, Kent
Registered at the Post Office as a newspaper
Dragon and its logo are trademarks of
Bentley Ltd.

How to submit articles

The quality of the material we can publish in
Dragon after each month's edit, is a very great ex-
tent dependent on the quality of the documents that
you can make with your Dragon. The Dragon
computer was launched on to the market with a
powerful version of Basic, but with very poor
documentation.

Articles which are submitted to Dragon User
for publication should not be more than 3000
words long. All submissions should be typed.
Please leave wide margins and a double space
between each line. Programs should, where
possible, be prepared printed on plain white
paper and be accompanied by a tape of the program.

We cannot guarantee to return every submit-
ted article or program, so please keep a copy. If
you submit a program or program in machine code, must
include a stamped addressed envelope.

Transatlantic Telegraph

I should like to extend a letter to Mr. Randy Longshore in the July issue of *Dragon* (letter). He comments on my CoCoDragon Basic converter published in the April issue.

Of course, Mr. Longshore is correct when he states that a Dragon cannot read CoCo discs, at least not directly. It is a great idea to use the procedure to modify CoCo discs in a Dragon and will most definitely contact him in this respect, especially since I myself have just begun work on a program that would copy all files on a CoCo disc to a Dragon disc. However, though a Dragon user might need to find a CoCo disc somewhere prepared to copy files from disc onto cassette, Mr. Longshore's opinion that my program would then be more or less superfluous oversimplifies matters.

First of all I should like to emphasize that not all Dragon users have disc drives, and that they cannot upgrade, even though it tries to deal with disc Basic (as does well-known, not all Basic software need necessarily come from a CoCo user. With my program the Dragon user also converts to commercial software written in Basic, eg the compilation tapes published by JamcoGroup, the American Rainbow magazine. This gives the Dragon user the ability to tap into the immense software pool available for the CoCo, albeit in a very limited sense.

Far more important, though, is the fact that it just will not always do to ask a CoCo user to save Basic files in ASCII. It occurs quite frequently that Basic programs which have been packed by removing superfluous spaces and by converting Basic lines to compactly saving them in ASCII tokens are replaced with longer ASCII text, and long lines may interfere with the result that ends of lines may be chopped off while saving to cassette. This may even happen with "normal" programs which have very long lines. This is not conjecture but sad experience and was one of the main reasons for writing my converter in the first place.

I appreciate Mr. Longshore's interest, and feel that readers of *Dragon* User can only profit from

thinking of exchange of information in the only large-scale medium available to Dragon users. I am of course interested in further comments or suggestions regarding my program.

Randy Longshore
Adelphi, New York
8-5200 (Area 2) 2nd
Belgium

Screens x 4

SINCE I have been using the Dragon screen manager, I would like it that someone out there will write software to create graphics on four PAGE0/04 screens linked together. You write code to use only the usual grid size, but can move around the screen that will be a grid of 256 x 256 (1024 x 1024). This is a better way to create a screen, by moving around with a kind of spying glass that will double every dot's height and width. Anyone will be able to do it after this screen. Get it?

I'm writing for you or know ones. Please send what you have done to DU.

Cliff Hader
Haver, East 3rd
East Haver, 20000
Israel

Where is Tandy?

COULD you please include the address of the Tandy User Group in your next issue of *Dragon* User. I have tried every address I could find to try and track them down without luck, and so I write to you.

Doug Gilson

HAVING made enquiries, it seems that the Tandy Users Club no longer exists in this country. I am told that one of the Northern Dragon Clubs inherited some of the membership of the old group, but I am not certain which one or what their address is at present. I will let you know as soon as I can find out. Also, the National Dragon User Group deals with Tandy as well as Dragon interests. They are at 6 Ravarino Road, Wethering, Sussex.

Range right

MAY I take this opportunity to give a pointer to the author link area on a "44" Location 44 FMM controls the rate, pace it with 1 to give a constant that does not vary when you add down the scale bar, and POKE 260,55 to update the screen. POKE 44, FMM, 5-POKE 260,55 to turn off the screen.

I also send a right justify routine which will take a line to A8 and justify it to a line length contained in variable L8, returning the justified line in B8. Has anyone got a better method.

```
100 RIGHT JUSTIFY
110 A8 = "This is just an
example"
120 A8 = A8 + " "
130 L8 = 32:F = 0:G = 0:N = 0:
P = 1:L = LEN(A8):B8 = ""
140 GOSUB 200:GOSUB
200 IF P = 0 THEN L = L
150 L = L - P:F = P:P = P
160 IF P = 1 THEN L = L
170 IF N = 1 THEN P = 2
180 IF P = 1 GOSUB 200
190 IF P = 1 GOSUB 200
200 IF P = 1 GOSUB 200
210 GOSUB 200:GOSUB 200
220 GOSUB 200:GOSUB 200
230 IF P = 1 GOSUB 200
240 GOSUB 200
250 IF P = 1 THEN
B8 = B8 + " "
GOTO 220
260 IF P = 1 GOSUB 200
270 IF P = 1 GOSUB 200
280 IF P = 1 GOSUB 200
290 IF P = 1 GOSUB 200
300 IF P = 1 GOSUB 200
310 IF P = 1 GOSUB 200
320 IF P = 1 GOSUB 200
330 IF P = 1 GOSUB 200
340 IF P = 1 GOSUB 200
350 IF P = 1 GOSUB 200
360 IF P = 1 GOSUB 200
370 IF P = 1 GOSUB 200
380 IF P = 1 GOSUB 200
390 IF P = 1 GOSUB 200
400 IF P = 1 GOSUB 200
410 IF P = 1 GOSUB 200
420 IF P = 1 GOSUB 200
430 IF P = 1 GOSUB 200
440 IF P = 1 GOSUB 200
450 IF P = 1 GOSUB 200
460 IF P = 1 GOSUB 200
470 IF P = 1 GOSUB 200
480 IF P = 1 GOSUB 200
490 IF P = 1 GOSUB 200
500 IF P = 1 GOSUB 200
510 IF P = 1 GOSUB 200
520 IF P = 1 GOSUB 200
530 IF P = 1 GOSUB 200
540 IF P = 1 GOSUB 200
550 IF P = 1 GOSUB 200
560 IF P = 1 GOSUB 200
570 IF P = 1 GOSUB 200
580 IF P = 1 GOSUB 200
590 IF P = 1 GOSUB 200
600 IF P = 1 GOSUB 200
610 IF P = 1 GOSUB 200
620 IF P = 1 GOSUB 200
630 IF P = 1 GOSUB 200
640 IF P = 1 GOSUB 200
650 IF P = 1 GOSUB 200
660 IF P = 1 GOSUB 200
670 IF P = 1 GOSUB 200
680 IF P = 1 GOSUB 200
690 IF P = 1 GOSUB 200
700 IF P = 1 GOSUB 200
710 IF P = 1 GOSUB 200
720 IF P = 1 GOSUB 200
730 IF P = 1 GOSUB 200
740 IF P = 1 GOSUB 200
750 IF P = 1 GOSUB 200
760 IF P = 1 GOSUB 200
770 IF P = 1 GOSUB 200
780 IF P = 1 GOSUB 200
790 IF P = 1 GOSUB 200
800 IF P = 1 GOSUB 200
810 IF P = 1 GOSUB 200
820 IF P = 1 GOSUB 200
830 IF P = 1 GOSUB 200
840 IF P = 1 GOSUB 200
850 IF P = 1 GOSUB 200
860 IF P = 1 GOSUB 200
870 IF P = 1 GOSUB 200
880 IF P = 1 GOSUB 200
890 IF P = 1 GOSUB 200
900 IF P = 1 GOSUB 200
910 IF P = 1 GOSUB 200
920 IF P = 1 GOSUB 200
930 IF P = 1 GOSUB 200
940 IF P = 1 GOSUB 200
950 IF P = 1 GOSUB 200
960 IF P = 1 GOSUB 200
970 IF P = 1 GOSUB 200
980 IF P = 1 GOSUB 200
990 IF P = 1 GOSUB 200
1000 IF P = 1 GOSUB 200
```

Fjord calling

THANKS for many excellent magazines. I wish to thank all software writers/publishers for all the superb games/programs that have arrived. One year ago all my Commodore

owning friends have no idea of the quality of the Dragon games. Now when they have seen *Dragon* Master Part, Joe Carter and others, they regularly come to me to play my Dragon games. I even have an Amiga-owning friend who likes my games.

And a last thanks to *Dragon* User. I read every page of it every month.

Continue Method
Ten Hells Star
Unseen 37
7502 Karm
Norway

Norway club

WE would like to tell you and your readers that we have a computer club for the Dragon and Tandy CoCo in Norway.

We have a monthly newsletter. We have members from all over Norway. We'd like to get in touch with other computer clubs all over the world.

If you want to know more about our computer club and what we are doing, please write to us for more information.

Trond Dragon/Tandy Club
Sandness
N-1000 Kjøbenhavn
Norway

Tyne and here

JUST to prove that the Dragon has a strong healthy following, could you please give a page to the NORTH EAST DRAGON USER'S CLUB. We have 14 members and meet every Wednesday 8.00pm in the Etchick lounge of the Concord Mill, Gosforth Rd., Sunderland. If anyone can make it we would be pleased to see them, or they can contact me.

Chris Johnson
20 Wellingham
Sunderland
Tyne and Wear
NE20 1HP

SUPPORT your local Dragon club.

News desk

If you'd like to try new products for the Dragon — software or hardware — ring the News Desk on 01-437 4343

Harris front end KLIKs

HARRIS Micro Software's new complete front end and line editor, called the KLIK Utility, is now available.

The package features point and click operation of the entire system from the keyboard or a mouse, with pull-down menus, pointers, a dialogue box, control buttons and help messages, selective directories, file icons, repeating DOS commands and a set of macros for easy control of the screen, windows, SPEAK, etc.

The word-processor like line editor has trace and pause facilities, and desktop facilities

include a disc based speaker, memo-pad, snapshot and PK, JK, Basic, which allows you to design your own windows, icons and menus.

There is, however, no snapshot function, as featured in one of our advertisements. Bob Harris says that he will give some thoughts to whether or not he should include it when he works out what it is.

The package costs £14.95 from Harris Micro Software, 49 Alexandra Road, Hounslow, Middlesex TW2 4HF. Bob Harris's Basic 42 was one of the best Dragon packages of 1988.

More from The Solver

SIMON Hargrave is pleased to announce the arrival of his latest adventure for the Dragon 32 and 64, the fourth in the Starcrash series.

The Hero of Tyos is an unusually large, 200-location adventure in a fantasy, with many associated module characters and events, some of them interactive. The split-screen game will accept full English sentences.

You play the Prince of Tyos, placed inside a mysterious pyramid by a rival monarch. To win peace for your kingdom,

and the kingdom, you must succeed in escaping. But your rival is devious and not to be trusted. To find the mysterious Amulet of Tyos is easy, but escaping alive is more difficult...

The game is randomised so that it will play differently on each occasion. Do you, asks Simon Hargrave, desire to accept the challenge?

This and Simon's games are available for £5 each (includes play from Casley Hill Farm, Uley Dunsay, Gloucestershire GL1 5BH).

New editor for Dragon Update — same old plea

THE November issue of Dragon Update, looking white and shiny, has just dropped out of the postman's bag and onto my foot. Why it's bundled up with two out of three mail. Why am I starting so close to the postman? He's not — I had to carry it up the stairs myself. Our postman may be late, but he's not stupid.

This is the first issue by new editor John Barry Caruth, and Paul Edwards insight out at the effort, which is fairly praiseful. This month's issue features Pascal for beginners (part 4), Memory Management on the Large Dragon, Easy Machine Code (part 14), Port part 2, a report on disc controllers (DIOs), some notes on the Touchmaster Graphics pad, a couple of games reviews, a supportive assessment of Dragon User since the Great Change (it's ironic to mention

one who can live without a full colour cover), and some thoughts from Paul Grade on copyright and circulating material. And yes, Paul, you're right, as professionals do have someone to make the coffee for us. He's called Russell Hobbs, and if anyone would like to organise a workshop, we could buy him a new lot for Christmas.

Harry is, as usual, appealing for more material. Sometimes I have a lot of fairly old submissions which just missed being published and which the owners don't wish to be returned. I wonder if you would be interested in looking at some of that...

Contact Niall at 61 Riverside Road, Wokingham, Sussex, or send material to Barry Caruth, 132 Donaghadee Road, Bangor, Co. Down, N. Ireland BT22 4AH.

Harry Whitehouse upgrades his power supply for the same price

THE famous AI Supersmooth Heavy Duty Power Supply has gained a couple of extra features at no extra cost, thanks to Harry Whitehouse.

The AI, which carries a two year guarantee and lifetime service warranty, is suitable for the Dragon 32 and 64, and recommended for all Dragonplus owners.

Now features a rapid reaction on/off switch as standard. This means that the Dragon's own fast-pace switch can be left permanently 'on', reducing the risk of failure.

A new design of D-connector has also been introduced, with a reliable safety clamping arrangement instead of a grub screw.

The AI Supersmooth still

costs £18.95 and £24.95 post and packing. It is manufactured by Peaksoft, and is available from Harry Whitehouse, 48 Queens Street, Bolton, Greater Manchester, M4 3JL, tel. 0608-765226.

"Quite a few owners have told us that they are purchasing an AI as a backup for their original Dragon unit, but we always suggest they use the AI and put their old unit in the cupboard. After all, if an AI ever failed — and to our knowledge that has never happened — the user will at least have the security of knowing that it is covered by the guarantee. On the other hand, if a Dragon Data fails, all you can do is throw it in the dustbin," said Harry.

69 Microcosm this month

69 MICROCOSM, the journal of the software Group has also just turned up. Contents include An Editors' View of Disk Format Programs, a look at the Atari 1340SE, disk type reporting, letters, 69 Micro Group Library, a guide to the use of 6801 PinA control register bits, Coco 3 update

review, and some news and personal system reviews. The group holds regular meetings in the London and Birmingham areas.

For information contact Keith Barnes, 170 Glen Aldergriff Road, Winterton, London SW16 6JG.



Image scanner from Epson

FOR the wealthy and ambitious in the desktop publishing world, Epson have come out with a low-cost, entry-level image scanner as an option on four of the company's printers, the 6300, 6300+, 6300+ and the 6300+LC/8000+.

The bundled software with the scanner is, surprise surprise, compatible with 6801 PC compatible machines, and the device costs under £200 and can read areas of 8 1/2" x 11" with the EX3000 and LG machines, and 6 1/2" x 11" on the EX3000.

Trapped in a castle with The Mad Cook

Title: *The King's Quest*
Supplier: Simon Margrave,
Chisley Hill Farm, Uley,
Cirencester, Glos. GL11 5BN
Price: £5.90

THIS is the second in a series of four adventures by the Solver himself. Knowing that he hasn't even solved the fourth one himself without cheating suggests that the others might not be exactly simple.

After a few loading problems at my end (solving Margrave's problem sending someone round with a letter is to be set up my cassette player at this moment) the game is loaded and runs automatically and then you're free to roam the castle mainly at your leisure.

In this program you play the role of Kungur who is still trying to get home after being helped in Starcatch (the first title in the series) and who has now got himself trapped in a castle. Your job is obviously to free this

hopeless character, although this is easier said than done.

Your first location is the courtyard from where you can go south, south or along a narrow side passage. Other rooms nearby include stables, kitchen and library, although the sprinkling of potentially useful objects for you to get hold of.

Then it's upwards via a 'magnificent staircase' to a floor of bedrooms and washrooms. Also on this floor is the tower of knives which has within it objects like a gold key and brass trumpet, but it is deceptively easy to get lost in the maze.

The tower of Mirrors is easily accessible on the Eastern side of the first floor, but your passage to the Western tower is blocked, an inscription on the wall reading it is not 'knave in reverse' — to progress into the tower simply solve the riddle.

To succeed in this game the art of solving riddles is not the only skill required, but also

strategical tactics. For instance there are various violent characters wandering about the castle such as the Mad Cook and the Prince who will frequently come knocking at you. Tactics are needed here to decide whether your strength is quite enough for you to defeat the boulder or whether to flee as quickly as possible — although you also lose your possessions. One person who is slightly helpful is the Philosopher, although he also disappears too quickly.

As well as your strength other Knight-Darkest-style features are the fact that you need a minimum score and experience level to enter, although it should be stressed that these minimums are not the maximums. Weight is another problem — not the size of your stomach, but how much you are allowed to carry. Some objects naturally weigh more than others, such as the sword found in the first location

which weighs 2000 of a possible 3000 units, not leaving you much room to carry much else.

The only problems with the game are the cost (five pence given for your responses, the 'time passed' message often appearing while you're entering a command), the fact that you have not been redesigned, but this can hardly be called a fault.

Otherwise there's not a lot wrong with this game. One particularly useful feature is the 'What' command which displays on screen all available verbs, thus helping you find the right phrase when you know what you want to do but don't know how to do it. This feature is just one indication of how much time and thought the author has put into this well-designed game which is well worth taking a look at.

Philip Scott



Follow the road from The Solver's Arms to Purley

Title: *The Quest For The Missing CP/Lib*
Supplier: Simon Margrave,
Chisley Hill Farm, Uley,
Cirencester, Glos. GL11 5BN
Price: £5.90

NUMBER three from Margrave's series — it's getting as devoted to writing adventures as he is to solving them.

Starcatch wasn't too hard for about the first 10 locations; *The King's Quest* wasn't too difficult until all and sundry started attacking you. The latest quest isn't too hard until about the first location. It's a good job the author also supplies solution sheets, although I haven't resorted to them yet — emphasis on yet.

What sets this apart from the previous two games is that here Margrave's difficulty you have not one but four characters to control all of which have their own skills and aptitudes. You can switch between these characters by use of the 'person' command and each can

do such things as eating and sleeping with problems that can require not just one but two of the characters to solve them. The quiet character splits up and go their separate ways by using the command 'split'.

The game begins in the 'Solver's Arms' public house with a landlord called Thylar (poor chap). Unfortunately your characters start getting philosophical and are told to disappear into the night. So off your characters are with odd articles like a computer tucked into a handbag and with four controllable characters you have four times as many hands and peckers.

So set into the world you go onto the A77 (luxurious setting for an adventure) on the seemingly endless road to Purley (and a long and truly real that one is too — it's) with only a policeman in sight. Now that policeman is found to be useful, isn't it?

After ignoring the first rule of delivery (try — to examine

everything — I eventually managed to find the missing place by disappearing down a nearby manhole and reappearing in a park).

Looking in the park is a wall of worms (that's what it says) and a box of marching harmonies (that's what it says again). Indeed there is a mad scene of horror apparent through out the game slightly reminiscent of that old devil *The Cockleweed* incident except that it is harder and more playful.

There are only five locations here, less than in the previous two games, although each seems to be unique rather than certain repeated ones as in *Starcatch*. As the game is more complex though the reduction in locations is natural.

The 'What' command is here again revealing all commands this time all of which can be entered in three letters, for example 'transfer' is 'ta. As with *The King's Quest*, the game is written in real time and therefore if you ponder too long, 'life

passes you by' will flash up on screen. If the pace is too quick, though, you can always 'wait' and stop your time.

There is however no 'score' feature so you can see how little of the game you have managed to complete, especially when you realise what you have to discover to end your search.

So that's the third in the series, not as easy to get immersed in as *The King's Quest* but more complex and challenging, certainly not a game to knock off in a couple of evenings. As for *King's Quest*, probably it is *King's Quest*, but as I only gave that four dragons, I'll give this five in the hope it will induce you the reader to keep buying software. The next in the series was randomly placed somewhere, like *Madness* and the *Mistress* — I can't even manage the ones where the objects are static.

Philip Scott



Expert's Arcade Arena

Write to 'The Expert' in Dragon User
13-13, Rifle Wharf St
London WC2R 1PP.

GREETINGS, viewers. Let me start by saying that I hope you are all about to have a Merry Christmas and a Happy New Year, though I haven't had a single Christmas present from you (probably because it's only November, but that's not the issue, is it?)

Moving swiftly to an apology from me (yes, I do hand them out occasionally — make a note in your diaries, without my fingers crossed, I must say that I'm sorry that the Arena has been on the air somewhat irregularly recently, but fear not, for I'm here for another series (however long). Don't forget to tune in every month.

All this creating is leading up to an appeal. I've finally got a 'round table' and decided to broadcast some requests for help on behalf of myself and (mostly) my devoted public. If you can offer any solutions, then please send them in. My postman has now recovered from his hysteria, and ghosts as he waits post the hospital without even delivering a single entry form for the Readers Digest Prize Draw. The warehouse I bought last year to store all your letters is now so empty that I've rented it out to film Michael Jackson videos in!

So, below in glorious technicolour black and white is the list of essentials that I like you, my loyal servants, to help with if you can.

Expert pleads

1) An answer to the question: 'What does Snake do, on completing level 5 of Back Street?'

2) Does Universe II of Total Eclipse really exist?

3) A program using the information of so many years ago (DU November 1985, to be exact) concerning the way screens are stored on Commodore EPP, to make a screen designer.

4) What are the codes at the end of each screen on Time Dancer? (Sounds familiar!)

5) A map of Jet Set Willy's. Believe this isn't an official game, so don't try to buy it, but there seem to be millions of copies in circulation.

6) A list of the information that you receive while playing the game section on The Death of Socrates.

7) Any POKERS at all for any of the following: Mid-Play, Wild, Glorious, Chairman, Screaming Archers, Superkid, Mission, Mover's Dream.

8) More maps. How about one for Mafuku Man?

9) The official solution to Escape.

10) A way of upgrading the old Bank to Dead to the better version without power surges.

Not too hard

Now if all or any of that lot's too hard for you, how about something you can all agree, regardless of IQ, IQ2, no IQs, etc? This is your chance to vote in the rest of the year, **The Expert's Total Software Survey**.

All you need to do is copy out the questions below along with your answers, of course, and send them to the usual address, where the editor will get them submitted up with the competition entries. They will then be forwarded to me and evaluated by my own fair hand, with a little help from Oluppu, my computer.

You may send in as many entries as you like, so long as you use a different name, address and style of handwriting for each.

Here are the essential categories for which you must nominate a winner:

1) Best arcade game for the Dragon — from the year dot to 1985. What has been your favourite game?

2) Most Arcade game — yes, I want to know what is the most utterly atrocious game in the history of the Dragon.

3) Favourite Programmer — you could say this one isn't a single one, someone as the best Dragon programmer, but there are a lot of good programmers out there, and it's about time those who've been working the hardest should get some credit. Here's a few suggestions: Kenneth Kuhlman (well known for games such as Invaders) Revenge, Danger Ranger, Escape, Phazon, Slays, Devil Assault, Outburst in the Jungle, and more.

Best Programmes

Roy Cooper has produced some good games — Mover's Dream, Jet Set Willy, Jean Steller etc. More recently Jason Patou has made a name for himself with titles such as Mover's Dream (which we are still trying to obtain copies of from Monochrome — all jaws) Snake Steady Go, John Martin is another faithful choice, famous for Mover's Dream and Jet Set Willy.

There are many programmers to vote for, but why don't we see their names on adverts? Usually the name of the game, and the software house appears, which brings me to the next category:

4) Best Software House — I considered splitting this into two parts, those surviving and those who have given up, but decided to make it a mixed bag. Here are a few names: Microdeal (Arbit), The King, Time Parat,

Speed Racer, all the Outbursts, Inventive Motion Creations, Kid Biology, Black Book, Snake Steady Go, Quickdraw (upcoming), Shadow Master, Fire Force, the Gemini series, Tom Mix (Cuber Mover) Bell, Claviers, Rasterpillar 23, Blasty (Olympic), Boulder Blast, Kame-Kang-Kung'N', Don't forget of course Hewson, Salamander, Peaksoft, Design Design, Morrison Motors, Infoburns House, and Mastertronic (oh, sorry, misprint. Did I say Mastertronic? I meant to say Software Projects) who have all produced some great games.

5) What's the most annoying aspect of any game? For example, the fact that you can't play Hungry House without cheating, you can't see a joystick for Olympic, and you lose all your lives if you die at a monster's start position on Jet Set Willy.

6) Most underrated game — which game was under advertised, underused, but is really good? Here are a few ideas: Steam Roller, Rigo Jo, Atom on a Mopler, Gears, Joe Gattini, AC Ball.

7) Most overrated game — which game turned out to be less like its adverts? My suggestions would be Hammerball, Omega Dilemma, Space Shards, Module Man.

8) The game you would most like to see converted to the Dragon — there are a lot of good arcade games not yet in Dragon versions. What would you most like to be zapping to by this time next year? (For example, Chuckie Egg's (various computers), Phoenix (arcade))

9) Best music to rap to. Type AUDIO ON before you load EDDC a game, then insert a music cassette during play, and you should be able to 'rap away' with a musical accompaniment. This is a long standing question and should be resolved once and for all.

10) Program which you would most like to see hacked — without telling me when game you would most like a cheat for and I'll challenge the many hackers out there to see who can come up with the goods first.

11) Next game printed in DU — there have been some great games such as Plan-Plan, Coped, Atom Hunt printed in DU. Which is your favourite? (By the way, don't ask me hacks for games printed in DU!)

Expert answers

So, these are the questions. Send off your answers to reach DU as soon as you can, and I'll do something about them as soon as I can.

That's all for this month. Thanks for all your letters, keep them coming in. I'll back next month with the usual hints and tips. Goodbye.

Introducing Modems

Kan G. Smith takes the computer to the phone

NEVER in the short history of micro-computers has a peripheral created more interest than the modem. The word "tackler" entered the language and headlines were made by people leaving naughty messages in VHS electronic mailboxes. A young tackler in America managed to get into the Pentagon mainframe and was arrested by the FBI, or so the story goes. Hollywood took the fantasy one stage further in *Johnny War* (James), with scenes of a nuclear war being evidently started by a young man with a micro. So much desire has it created that for some people it is the first gadget they buy. For those of us that for comparison's sake have only just joined the on-line or are more importantly those already considering joining, hope this article will help you to find out what a modem is, what it can do for you and what you can do with it.

How it works

When it comes to computers, the advertising people seem to fall into two camps assuming that we are all experts, so the first job is to explain briefly how the modem works. The name is an abbreviation of "modulator/demodulator", and what it does is to translate the binary ones and zeros into audio frequencies in a similar way to that used by the cassette port. The system uses analogues pitch for a one and another pitch for a zero. Using this system the computer transmits its information down the phone line and receives the opposite, converting the sound waves into ones and zeros, to receive. The rate at which this data is exchanged is called the baud rate and is quoted in bits per second, one bit being a single one or zero. Baud rates are being quoted less and less these days and are being replaced by "V" numbers, which at first sight seem even more confusing; a brief guide follows:

V21: baud rate 300 receive and transmit, very popular with modem users in America and early users here, now losing ground to V23.

V22: baud rate 1200 send and receive, little used at present but gaining popularity.

V22bis: this is a business users' system for people whose time is money and sends and receives at 2400 bit per second.

V23: often quoted as 120675. This is the most popular system. Receiving at 1200 baud and transmitting at 75, it is used by most view data systems and many bulletin boards.

Full-duplex: This is a much less fully interactive system and I do not know of any

modems that do not have at least one full-duplex mode. Some will operate full duplex in V23 and half duplex in V22. The difference is most easily explained by comparing the difference between the telephone and a two-way radio. On the telephone, both users can talk at the same time, interrupt each other and even speak full duplex, whereas on two-way radio, one operator must give over of message signal and cease transmission before the other can speak (half duplex). In fact, with a half duplex system, if both parties try to transmit at the same time nobody gets anything, just with the radio. Adventure systems sometimes use "FullDuplex" as a means of indicating that the machine will send and receive at the same baud rate, at the same time.

Xmodem: this is a protocol governing the way information is transmitted and received. It makes data transmission more reliable (reducing the risk of corruption) and allows you to connect to any other machine. As long as they are both using the same baud rate and the same protocol any make of computer can converse with any other. Most bulletin boards operate on Xmodem system.

Auto-dial: speaks for itself really, as it enables you to keep a personal phone directory on your computer. Once programmed, the machine will call anyone you tell it to call, which also means that you do not need a phone to operate your modem.

Auto answer: also self explanatory, only necessary if you want to run your own bulletin board. It is important to remember that a modem is operated through the RS232C port so if you have a Dragon 32 you will need an input/output cartridge with this facility.

Artis stage of the game you need to decide why you want to get "on-line". If your aim is world domination by Friday, forget it. The ability have switched all their important data onto microwave transmissions, and if you can afford to interrupt them then you probably don't buy a Dragon. Choosing the balance on your credit cards is not as easy as some might think, it takes a lot of time and know-how to penetrate such a system, and if you are capable of doing that then you are probably not going to bother reading this article. Anyone searching for a reason to get online really need look no further than electronic mail. There are several systems available at the moment with more to come.

Viewdata

These usually operate on Viewdata, which in addition to text, also gives a limited graphics capability. To use, these systems you will need to be in P8000A, as no

colour is available. However, if like me you are a black and white television and a single colour printer, then colour is of little consequence. Most systems will have a local number for you to call, the host computer directing your message to the recipient mailbox. When he next uses the system he will be told that there is a message waiting. He can read an reply immediately or save it to deal with later.

Bulletin boards

Another week a pursuit comes with the use of local bulletin boards. These normally operate on an ASCII scrolling screen principle, using the normal refresh screen with file transfer under the BACODEM protocol. Here you will find sales and want ads, programs for you to download, a place to air your views to the world and a store of all sort of people willing to help each other just for the pleasure of doing it. Some boards will expect some form of subscription but most are free. Many special interest groups set up their own boards. My local one was set up with dentists in mind but the systems operator or sysop doesn't mind people with other interests using it.

The adventures among us will lose another facility that is available to modem users, namely MUD. Even for most of our Dragon game this is similar to Dungeons and Dragons on an adventure game bulletin board. At the time you are not just playing against the computer but everyone that plays the game has their own identity within the game and the participants play against each other with the computer acting as referee. There is usually a subscription copy first to run the hardware, the infinite variation will make it worthwhile. Armed with this knowledge and the fact that some of the long standing bulletin boards still use V21, you should be in a position to decide which device you want to buy.

Software

Once you have settled on which modem to buy, you will need the software to drive it. If possible, buy it from the software machine, but then software people writing for the Dragon these days and if you want a particular modem, you might have to go elsewhere for the software to drive it. There are two different levels generally available. The first is somewhat basic, which is not to say that it isn't very useful, it would normally consist of two or three programs. Firstly there would be a Viewdata system; this would give you all the Viewdata graphics and text on a forty column screen. All messages would have to be entered via the keyboard while on line

and to save messages you would have to save the whole screen to disc. The Asci program for bulletin boards would operate on the standard 30x80 screen which can mean some very rapid scrolling since most boards operate one-40 by 84. The result of this is that each line on the board will occupy two lines on the screen. All incoming data can be stored in a buffer and saved to disc at tape at regular intervals. This is sort of software you would expect to find bundled with your modem and is best described as adequate.

There is one tale that is certainly no myth, namely that a modem can get you in a whole lot of trouble, especially if you are not the one that pays the phone bill. The last thing that you want is to come home and find all your equipment has been sold to settle up with BT. So study your phone bill, make note of all the codes marked L, and use those in preference to others. Also, check all those with a charge code a or bi, these are your reserves. Keep the time down and you should be okay. Any code with a charge code

nothing out of it save the satisfaction of helping the rest of us. So before you log off leave a message for the sysop to tell him what you think of this board. It might make his day.

Below have telecome numbers you might find useful.

6800 Board 1200/75 01-268-7600 24hrs
Minsky 060/300 0600-773366 Sat-Thu
2700-0500



At the other end of the scale there is the system that only runs under Flex or OS-6 and supports a video dial, allows you to prepare messages before going on-line and allows incoming data to be diverted to the disc drive to be read later. With this system, you even get a 51 x 84 display on the Asci program. However the price does tend to put you off somewhat. The real tragedy is there does not seem to be anything in between. A system that would run under BASIC42 or still a for instance. The only advice I can give is get the best you can afford.

It is going to cost you about a pound for 10 minutes during an off peak period. If the board you use has a cost actor facility, then use it frequently and keep a note of the various states over the weeks.

Well Hyperflex has helped any of you contemplating going on-line and so that once you have got your modem you will also have someone to call for included some useful numbers. One last thing to mention before I go is that most of the people that operate bulletin boards have invested a lot of money and time on their system. They are really go-

00000 300/300 1200/75 0700-776075
0700-76075
00000 300/300 0075-0100 to 24hrs
1100 11 300/300 1200/75 021-444-1484

All these boards have Dragon sections. A list of boards can be found on the "Data" boards 01-676-1660 for 300/300 and 01-676-4160 for 1200/75.

Your local modeme at 000/000 or by the 0000 board or leave a message on 0007-070162.

Crossword

These second great month of the Dragon Crossword! We have no reports of your virtual veracity yet, because, despite the legend (how you know why it's called a legend) on the front cover, it is still November here in Little Newport Street, none of you have seen the crossword, and only the preexisting telepaths have replied.

Don't forget that there will be a couple of free tapes from the Editor's Magic Bottonless Box for the first correct entries to reach us each month. You can even try telling us which tapes you'd like in an ideal world. No promises. It all depends on what we have in stock.

And you don't have to put up your Dragon User either — heaven forbid! Entries can be written out on a prospect or a plain piece of paper, as long as we can read them.

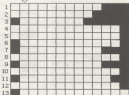
And to be brief:

1. Put your jewellery into fortification (3,7)
2. Bed in Lincoln Green? (5,4)
3. Only things, is dumps (7)
4. Is the Enterprise one? (3,7)
5. Her young char told you he's staring (4,6)
6. Does it fight its battles on the underground? (7,4)
7. A sign of two paintbrushes plus two (9)
8. Old Van Gogh became one? (8,7)
9. Nigel and Alain are both in it (5,4)
10. Gender and grammar is a job in television? Part! (8,8)
11. Make to come into tender rise (4,6)
12. Attack on Sater? (5,7)
13. Rock spot hero claims a soldier (3,7)



by Terry and Derek Prebys

All this month's answers are names of Dragon software. When the crossword is complete, the column marked with an arrow will spell out a phrase.



Pamcodes

Pam D'Arcy continues her introduction to machine codes

I trust that no difficulties were encountered in displaying your name in the top-left position of the screen. My program instructs in **Listing 1**:

I wonder if any readers thought "why not paste the name directly to the top screen area (lines 4-5) on the Dragon?" Using LDA/STA instructions? Using the output character ROM call \$B000 has many benefits that it carries out some functions that would otherwise need to be performed within our programs. For instance, if you "poked" a "P" directly into the top-left screen location (\$400):

```
LDA #P
STA $400
RTS
```

— In Basic, POKESHA00,ASC("P"), a capital P would appear. However, anything symbol, capital letters or lowercase letters retain their original values (decimal ASC values, or character codes, 64-95) when being displayed. All other characters have adjustments made to their values to match the needs of the hardware display chips in the machine. I didn't use lower case characters in the display of my name for cleanness, but to make this point. Putting a lower case character into the top left of the screen does not result in the reversed screen (green or black) of character s . . .

CLS (clear the result may be coded off the top by the OR display after the POKC command)

POKC (\$400,ASC("P"))

(quick memory jogger for those who read it — lower case — reverse screen — letters are obtained from the keyboard by holding down shift and pressing zero, after typing in required reversed characters, repeat shift+0 to return to normal display mode).

If that results in L, what does POKESHA00,ASC("P") give? The technical reasons for this are discussed in the book inside the Dragon, page 198. As well as carrying out such character code conversions, \$B00C acts as appropriate when it receives an "end of line" or carriage return (ASCII) character — that is clear the rest of the line in spaces and sets the next print position to the start of the next line. It also takes care of scrolling the screen up one line if the last screen position is being used (SCFT).

Keyboard input

Most programs will not be using fixed data as above but will be dealing with information held on a file or being input from the keyboard. We can then substitute printing the fixed characters of a name by printing the fixed characters of a name by printing the name (and other) data as it is input on the keyboard. The program needs to be able to

determine when input is complete, so that it can return to Basic, so you can choose what condition determines that for you. For example, I shall use a press of the ENTER key.

As with displaying a character on the screen, there is a ROM routine that can be used to obtain keypresses. This is at address \$B005. It puts the ASC (two-decimal ASCII) value of the keypress in register A. If there was no keypress, register A will be set to null (\$00). Using two clear screens and prints keypresses until ENTER is pressed. I shall be dealing with branch instructions (BCC/BNE) in a moment.

Line 38 causes a jump back to line 34 (get a character) ROM call if there was no keypress. This forms a "loop" of code that is repeated ad nauseum until the exit condition is met (in this instance, a key is pressed). Line 40 prints the keypress (this is a printable value for example, left arrow still deletes a character; break is ignored etc). Line 50 checks for the terminating condition — GO if any key contents of register A with the actual ASCII value for the carriage return (written at label GETKEY in Basic Not Fixed). This is a further loop of code that continues until its exit condition is met (enter key pressed).

If there is a program error preventing the exit condition being met, for example, above comparing the keypress with a value that can be input, the program simply sits there, looping away round the code — it never gets stuck! The break key (also button of Basic programs) is ineffective in machine code — well as our own — so if it does occur only be broken by pressing the RESET button.

Unique labelling

In Basic programs, GOTOs and GOSUBs always jump to a unique location — the line number — which cannot, obviously, be duplicated in a program (the Basic editor comments the original line on any subsequent input of the same line number). Assembly sources use our own label names forming around programs. Label names must be unique in the program (I'll know which label to use, duplicate names are usually detected in the assembly stage, but the error message may not be very clear — the kind of "phrasing error" or "undefined symbol" (label names are usually referred to as symbols in assembly)) are often caused by accidentally duplicating a name in the label column.

The next screen position maintained by

Listing 1

EXPECTED GENERATED OBJECT CODE	LINE NUMBER	LABEL	SOURCE Mnemonic	CODE OPERAND
80 BA 77	10	GO	JSR	\$BA77
86 50	20		LDA	#P
8D 80 0C	30		JSR	\$B00C
84 61	40		LDA	#s
8D 80 0C	50		JSR	\$B00C
84 6D	60		LDA	#m
8D 80 0C	70		JSR	\$B00C
39	80		RTS	
	90			

Listing 2

EXPECTED GENERATED OBJECT CODE	LINE NUMBER	LABEL	SOURCE Mnemonic	CODE OPERAND
8D BA 77	10	GO	JSR	\$BA77
8D 80 04	20	GETKEY	JSR	\$B005
27 F8	30		BEQ	GETKEY
8D 80 0C	40		JSR	\$B00C
81 0D	50		CMPA	#50
26 FA	60		BNA	GETKEY
39	70		RTS	
	80			

The Memory Address (MADR) may also be known as a "test screen pointer" or "current cursor address" and is held in the two bytes at address \$08508. The content of this pointer is another address — the next test screen address to be used for display. When the screen is cleared (CLR), the content of this pointer is reset to the first address of the test screen (\$400). When the test screen has been scrolled up or down, the content of the pointer is reset to contain the address of the start of the last line of the screen. \$0850C: Receipt of carriage return characters causes the cursor to be at the address of the start of the next line, subject to a scroll condition being encountered. Unless any of these special cases are met, display of a character causes the address in the test screen pointer to be incremented by 1. Unlike the graphics display, even in machine code, the position of the test screen is fixed at \$400-\$5FF.

To display text at a specific point on the test screen (Basic PRINT is stateless), the appropriate address can be calculated and stored in the test pointer prior to calling the PCMD routine \$080C. There is one point per character byte, so the $\text{address} = \text{base} + \text{row} \times \text{column}$ formula. For example, to print "PRINT" at row 258 = \$400 + 258, or \$400 + \$480, so to print is same as input a 258 could appear as in listing three.

What \$080C doesn't do is check the character of the pointer is between \$400-\$5FF before it displays the next character (why couldn't it check something that it is in charge of?). As is at machine code or Basic (PCMD) manipulation of Basic's workspace

locations, the PCMD interpreter is expecting everything to be valid so any results may occur if we step out of line — it cannot distinguish between accidental and deliberate sabotage. As Zihars said, "nature on our side is machine code. This also allows us to cheat the system when it suits us."

Branching out

The condition code register (CCR) was mentioned in the last issue as being one of the single byte registers on the Dragon. Each of the eight bits has a specific test and the execution or otherwise of a branch instruction depends upon current setting of one or more of these bits, or flags, at that moment. Some instructions affect some of these flags; others none. In general, we should be able to manage without gory detail.

As with the instructions in general, some are used much more frequently than others — and others almost never. It really does depend upon the nature of the program. A common problem with branch instructions is using a signed branch when an unsigned one should have been used — discussed in a moment. One of my greatest programming aids is having copied out table one onto a postcard for instant access.

There are also BEQ (Branch on Equal) and BNE (Branch Not Equal) that act independently of signed/unsigned conditions. BEQ is also a "branch out" instruction with BNE is complementary. "branch if not zero".

TABLE OF BRANCH INSTRUCTIONS

SIGNAL	NAME	EQUIVALENT
BZF	BEQ/BOC/BNP	
BCT	BEQ	
BLZ	BLE	
BLT	BLQ/BC/BNQ	
BVC		
BVS		

You can probably self-determine the conditions of many of the above branch instructions — Greater/Equal; Greater/Than; Less/Equal; Less/Than; the V instructions are the less frequent (Mnemonic/Not/More/Get — they probably won't be dealt with except in passing in the end of the series). On the unsigned side are High/Low; Carry Clear; Plus; High; Lower/Low; L/Clear; Carry Set; Minus. The BPL and BML instructions are shown in brackets as there are certain conditions when they will give a false condition because of OVERFLOW in processing. Generally, after arithmetic on signed numbers, use the related signed comparison instructions.

Also in the branch range are BAA (Branch Always); BBN (Branch Never) — of little practical use — it "maintains the symmetry of the instruction set" — all the branch instructions have complementary pairings — BLT/BGE etc. BBR (Branch to Subroutine) completes the branch instructions.

The branch instructions, including BBR, generate position independent code — that is if you take the source code that we have been using so far in this series, apart from the flag of PCMD only being a fixed position, the same saved object code will work whether relocated, say \$0801 or \$0808 or \$080C (the latter for Dragon 64 users who have mapped ROM to RAM while running 32K mode). This is because our "good" instructions have all been of the position independent nature of the branch instructions, as opposed to JMP. Unlike some machines, there are no conditional JUMP instructions on the Dragon (but we do have goodies that other machines haven't got), so, for illustrative purposes, I shall adjust the second loop exit code of the above as in listing four.

If the object code is saved (SAVEH) "NAME" \$1000/\$1000) and loaded some time in the future at its "default" address (address the code was saved from) and is executed, it will run correctly. However, if it is loaded elsewhere in the machine, unless the first happens is a "enter" (the instruction in line 05, JMP GETKEY is of the extended mode — actual address hyperdiscussed in last month's article, and the address generated within the object code, \$0808, will be branched to REGARDLESS OF THE PROGRAM'S CURRENT LOAD ADDRESS, leading to potential disaster.

The branch instructions are as useful as they generate code that says "branch to this instruction at + or - a number of bytes from this instruction". Some assemblers permit

Listing 3

GENERATED OBJECT	EXPECTED CODE NUMBER	LINE	LABEL	SOURCE CODE MNEMONIC	OPERAND
BD BA 77	10	GO	JSR	\$BA77	
CC 03 00	14		LDD	\$5100	
DD 00	17		STD	\$00	
BD 00 04	20	GETKEY	JSR	\$0004	
27 FB	30		DDQ	GETKEY	
BD 00 0C	40		JSR	\$000C	
81 00	50		CMPL	\$500	
26 FA	60		BNE	GETKEY	
39	70		RTS		
	80				

Listing 4

OBJECT ADDRESS	GENERATED OBJECT	EXPECTED CODE NUMBER	LINE	LABEL	SOURCE CODE MNEMONIC	OPERAND
3061	BD BA 77	10	GO	JSR	\$BA77	
3064	CC 03 00	14		LDD	\$5100	
3067	DD 00	17		STD	\$00	
3069	BD 00 04	20	GETKEY	JSR	\$0004	
306C	27 FB	30		DDQ	GETKEY	
306E	BD 00 0C	40		JSR	\$000C	
3071	81 00	50		CMPL	\$500	
3073	27 03	60		BEQ	STOP	
3075	7E 30 09	65		JMP	GETKEY	
3078	39	70	STOP	RTS		
3079		80				

Continued on page 24

Listing 3

000000	0.00	0.00	000000	0.00	0.00
000001	0.01	0.01	000001	0.01	0.01
000002	0.02	0.02	000002	0.02	0.02
000003	0.03	0.03	000003	0.03	0.03
000004	0.04	0.04	000004	0.04	0.04
000005	0.05	0.05	000005	0.05	0.05
000006	0.06	0.06	000006	0.06	0.06
000007	0.07	0.07	000007	0.07	0.07
000008	0.08	0.08	000008	0.08	0.08
000009	0.09	0.09	000009	0.09	0.09
000010	0.10	0.10	000010	0.10	0.10
000011	0.11	0.11	000011	0.11	0.11
000012	0.12	0.12	000012	0.12	0.12
000013	0.13	0.13	000013	0.13	0.13
000014	0.14	0.14	000014	0.14	0.14
000015	0.15	0.15	000015	0.15	0.15
000016	0.16	0.16	000016	0.16	0.16
000017	0.17	0.17	000017	0.17	0.17
000018	0.18	0.18	000018	0.18	0.18
000019	0.19	0.19	000019	0.19	0.19
000020	0.20	0.20	000020	0.20	0.20
000021	0.21	0.21	000021	0.21	0.21
000022	0.22	0.22	000022	0.22	0.22
000023	0.23	0.23	000023	0.23	0.23
000024	0.24	0.24	000024	0.24	0.24
000025	0.25	0.25	000025	0.25	0.25
000026	0.26	0.26	000026	0.26	0.26
000027	0.27	0.27	000027	0.27	0.27
000028	0.28	0.28	000028	0.28	0.28
000029	0.29	0.29	000029	0.29	0.29
000030	0.30	0.30	000030	0.30	0.30
000031	0.31	0.31	000031	0.31	0.31
000032	0.32	0.32	000032	0.32	0.32
000033	0.33	0.33	000033	0.33	0.33
000034	0.34	0.34	000034	0.34	0.34
000035	0.35	0.35	000035	0.35	0.35
000036	0.36	0.36	000036	0.36	0.36
000037	0.37	0.37	000037	0.37	0.37
000038	0.38	0.38	000038	0.38	0.38
000039	0.39	0.39	000039	0.39	0.39
000040	0.40	0.40	000040	0.40	0.40
000041	0.41	0.41	000041	0.41	0.41
000042	0.42	0.42	000042	0.42	0.42
000043	0.43	0.43	000043	0.43	0.43
000044	0.44	0.44	000044	0.44	0.44
000045	0.45	0.45	000045	0.45	0.45
000046	0.46	0.46	000046	0.46	0.46
000047	0.47	0.47	000047	0.47	0.47
000048	0.48	0.48	000048	0.48	0.48
000049	0.49	0.49	000049	0.49	0.49
000050	0.50	0.50	000050	0.50	0.50
000051	0.51	0.51	000051	0.51	0.51
000052	0.52	0.52	000052	0.52	0.52
000053	0.53	0.53	000053	0.53	0.53
000054	0.54	0.54	000054	0.54	0.54
000055	0.55	0.55	000055	0.55	0.55
000056	0.56	0.56	000056	0.56	0.56
000057	0.57	0.57	000057	0.57	0.57
000058	0.58	0.58	000058	0.58	0.58
000059	0.59	0.59	000059	0.59	0.59
000060	0.60	0.60	000060	0.60	0.60
000061	0.61	0.61	000061	0.61	0.61
000062	0.62	0.62	000062	0.62	0.62
000063	0.63	0.63	000063	0.63	0.63
00			00		

[illegible]

Unit 3: Social Studies

[illegible][illegible][illegible][illegible]

[illegible]

1000

[illegible]

1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 26

[illegible]

Listing 5 continued

74001	01 0000	00		ABNO	00	0			
74004	00 00	11		STB	0000	0			
74006	00 00	00		STB	0000	0			
74008	00 0000	00		LBA	00000	0			
74010		24	00001	0000	0-0				
74012	00 0000	24		ABNO	00000	0			
74014		0	00000	ABNO	00000	0			
74016	00 0000	20	00000	0000	0-0				
74018	0000 0000	00		ABNO	00000	0			
74020		40	00000	0000	0-0				
74022	00 0000	41		STB	00000	0			
74024	00 01	40		ABNO	0, 0	0			
74026	00 00	40		STB	00	0			
74028		00	TABLE	000	00000				

00000, 00000, 00000, 00000, 00000, 00000, 0000, 00, 00000, 00000, 00000, 00000, 00000

74030	00 00	40							
74032	00 00	40							
74034	00 00	40							
74036	00 00	40							
74038	00 00	40							
74040	00 00	40							
74042	00 00	40							
74044	00 00	40							
74046	00 00	40							
74048	00 00	40							
74050	00 00	40							
74052	00 00	40							
74054	00 00	40							
74056	00 00	40							
74058	00 00	40							
74060	00 00	40							
74062	00 00	40							
74064	00 00	40							
74066	00 00	40							
74068	00 00	40							
74070	00 00	40							
74072	00 00	40							
74074	00 00	40							
74076	00 00	40							
74078	00 00	40							
74080	00 00	40							
74082	00 00	40							
74084	00 00	40							
74086	00 00	40							
74088	00 00	40							
74090	00 00	40							
74092	00 00	40							
74094	00 00	40							
74096	00 00	40							
74098	00 00	40							
74100	00 00	40							
74102	00 00	40							
74104	00 00	40							
74106	00 00	40							
74108	00 00	40							
74110	00 00	40							
74112	00 00	40							
74114	00 00	40							
74116	00 00	40							
74118	00 00	40							
74120	00 00	40							
74122	00 00	40							
74124	00 00	40							
74126	00 00	40							
74128	00 00	40							
74130	00 00	40							
74132	00 00	40							
74134	00 00	40							
74136	00 00	40							
74138	00 00	40							
74140	00 00	40							
74142	00 00	40							
74144	00 00	40							
74146	00 00	40							
74148	00 00	40							
74150	00 00	40							
74152	00 00	40							
74154	00 00	40							
74156	00 00	40							
74158	00 00	40							
74160	00 00	40							
74162	00 00	40							
74164	00 00	40							
74166	00 00	40							
74168	00 00	40							
74170	00 00	40							
74172	00 00	40							
74174	00 00	40							
74176	00 00	40							
74178	00 00	40							
74180	00 00	40							
74182	00 00	40							
74184	00 00	40							
74186	00 00	40							
74188	00 00	40							
74190	00 00	40							
74192	00 00	40							
74194	00 00	40							
74196	00 00	40							
74198	00 00	40							
74200	00 00	40							

74202	00 00	40							
74204	00 00	40							
74206	00 00	40							
74208	00 00	40							
74210	00 00	40							
74212	00 00	40							
74214	00 00	40							
74216	00 00	40							
74218	00 00	40							
74220	00 00	40							
74222	00 00	40							
74224	00 00	40							
74226	00 00	40							
74228	00 00	40							
74230	00 00	40							
74232	00 00	40							
74234	00 00	40							
74236	00 00	40							
74238	00 00	40							
74240	00 00	40							
74242	00 00	40							
74244	00 00	40							
74246	00 00	40							
74248	00 00	40							
74250	00 00	40							
74252	00 00	40							
74254	00 00	40							
74256	00 00	40							
74258	00 00	40							
74260	00 00	40							
74262	00 00	40							
74264	00 00	40							
74266	00 00	40							
74268	00 00	40							
74270	00 00	40							
74272	00 00	40							
74274	00 00	40							
74276	00 00	40							
74278	00 00	40							
74280	00 00	40							
74282	00 00	40							
74284	00 00	40							
74286	00 00	40							
74288	00 00	40							
74290	00 00	40							
74292	00 00	40							
74294	00 00	40							
74296	00 00	40							
74298	00 00	40							
74300	00 00	40							
74302	00 00	40							
74304	00 00	40							
74306	00 00	40							
74308	00 00	40							
74310	00 00	40							
74312	00 00	40							
74314	00 00	40							
74316	00 00	40							
74318	00 00	40							
74320	00 00	40							
74322	00 00	40							
74324	00 00	40							
74326	00 00	40							
74328	00 00	40							
74330	00 00	40							
74332	00 00	40							
74334	00 00	40							
74336	00 00	40							
74338	00 00	40							
74340	00 00	40							
74342	00 00	40							
74344	00 00	40							
74346	00 00	40							
74348	00 00	40							
74350	00 00	40							
74352	00 00	40							
74354	00 00	40							
74356	00 00	40							
74358	00 00	40							
74360	00 00	40							
74362	00 00	40							
74364	00 00	40							
74366	00 00	40							
74368	00 00	40							
74370	00 00	40							
74372	00 00	40							
74374	00 00	40							
74376	00 00	40							
74378	00 00	40							
74380	00 00	40							
74382	00 00	40							
74384	00 00	40							
74386	00 00	40							
74388	00 00	40							
74390	00 00	40							
74392	00 00	40							
74394	00 00	40							
74396	00 00	40							
74398	00 00	40							
74400	00 00	40							

Listing 5 continued

74009	00 04	166	STB	4, 3	74010	04 00/4	210	LSA	100/4
74010	10 04	167	STB	10, 3	74011	04 04	211	LSB	010
74011	20 04	168	STB	10, 3	74012	04 08	212	MSL	
74012	30 04	169	STB	10, 3	74013	04 08	213	LSA/	0, 0
74013	40 04	170	STB	10, 3	74014	04 08	214	LSB	0, 0
74014	50 04	171	STB	10, 3	74015	04 08	215	LSB	0, 0
74015	60 04	172	STB	10, 3	74016	04 08	216	LSB	0, 0
74016	70 04	173	STB	10, 3	74017	04 08	217	LSB	0, 0
74017	80 04	174	STB	10, 3	74018	04 08	218	LSB	0, 0
74018	90 04	175	STB	10, 3	74019	04 08	219	LSB	0, 0
74019	00 05	176	STB	10, 3	74020	04 08	220	LSB	0, 0
74020	10 05	177	STB	10, 3	74021	04 08	221	LSB	0, 0
74021	20 05	178	STB	10, 3	74022	04 08	222	LSB	0, 0
74022	30 05	179	STB	10, 3	74023	04 08	223	LSB	0, 0
74023	40 05	180	STB	10, 3	74024	04 08	224	LSB	0, 0
74024	50 05	181	STB	10, 3	74025	04 08	225	LSB	0, 0
74025	60 05	182	STB	10, 3	74026	04 08	226	LSB	0, 0
74026	70 05	183	STB	10, 3	74027	04 08	227	LSB	0, 0
74027	80 05	184	STB	10, 3	74028	04 08	228	LSB	0, 0
74028	90 05	185	STB	10, 3	74029	04 08	229	LSB	0, 0
74029	00 06	186	STB	10, 3	74030	04 08	230	LSB	0, 0
74030	10 06	187	STB	10, 3	74031	04 08	231	LSB	0, 0
74031	20 06	188	STB	10, 3	74032	04 08	232	LSB	0, 0
74032	30 06	189	STB	10, 3	74033	04 08	233	LSB	0, 0
74033	40 06	190	STB	10, 3	74034	04 08	234	LSB	0, 0
74034	50 06	191	STB	10, 3	74035	04 08	235	LSB	0, 0
74035	60 06	192	STB	10, 3	74036	04 08	236	LSB	0, 0
74036	70 06	193	STB	10, 3	74037	04 08	237	LSB	0, 0
74037	80 06	194	STB	10, 3	74038	04 08	238	LSB	0, 0
74038	90 06	195	STB	10, 3	74039	04 08	239	LSB	0, 0
74039	00 07	196	STB	10, 3	74040	04 08	240	LSB	0, 0
74040	10 07	197	STB	10, 3	74041	04 08	241	LSB	0, 0
74041	20 07	198	STB	10, 3	74042	04 08	242	LSB	0, 0
74042	30 07	199	STB	10, 3	74043	04 08	243	LSB	0, 0
74043	40 07	200	STB	10, 3	74044	04 08	244	LSB	0, 0
74044	50 07	201	STB	10, 3	74045	04 08	245	LSB	0, 0
74045	60 07	202	STB	10, 3	74046	04 08	246	LSB	0, 0
74046	70 07	203	STB	10, 3	74047	04 08	247	LSB	0, 0
74047	80 07	204	STB	10, 3	74048	04 08	248	LSB	0, 0
74048	90 07	205	STB	10, 3	74049	04 08	249	LSB	0, 0
74049	00 08	206	STB	10, 3	74050	04 08	250	LSB	0, 0
74050	10 08	207	STB	10, 3	74051	04 08	251	LSB	0, 0
74051	20 08	208	STB	10, 3	74052	04 08	252	LSB	0, 0
74052	30 08	209	STB	10, 3	74053	04 08	253	LSB	0, 0
74053	40 08	210	STB	10, 3	74054	04 08	254	LSB	0, 0
74054	50 08	211	STB	10, 3	74055	04 08	255	LSB	0, 0
74055	60 08	212	STB	10, 3	74056	04 08	256	LSB	0, 0
74056	70 08	213	STB	10, 3	74057	04 08	257	LSB	0, 0
74057	80 08	214	STB	10, 3	74058	04 08	258	LSB	0, 0
74058	90 08	215	STB	10, 3	74059	04 08	259	LSB	0, 0
74059	00 09	216	STB	10, 3	74060	04 08	260	LSB	0, 0
74060	10 09	217	STB	10, 3	74061	04 08	261	LSB	0, 0
74061	20 09	218	STB	10, 3	74062	04 08	262	LSB	0, 0
74062	30 09	219	STB	10, 3	74063	04 08	263	LSB	0, 0
74063	40 09	220	STB	10, 3	74064	04 08	264	LSB	0, 0
74064	50 09	221	STB	10, 3	74065	04 08	265	LSB	0, 0
74065	60 09	222	STB	10, 3	74066	04 08	266	LSB	0, 0
74066	70 09	223	STB	10, 3	74067	04 08	267	LSB	0, 0
74067	80 09	224	STB	10, 3	74068	04 08	268	LSB	0, 0
74068	90 09	225	STB	10, 3	74069	04 08	269	LSB	0, 0
74069	00 10	226	STB	10, 3	74070	04 08	270	LSB	0, 0
74070	10 10	227	STB	10, 3	74071	04 08	271	LSB	0, 0
74071	20 10	228	STB	10, 3	74072	04 08	272	LSB	0, 0
74072	30 10	229	STB	10, 3	74073	04 08	273	LSB	0, 0
74073	40 10	230	STB	10, 3	74074	04 08	274	LSB	0, 0
74074	50 10	231	STB	10, 3	74075	04 08	275	LSB	0, 0
74075	60 10	232	STB	10, 3	74076	04 08	276	LSB	0, 0
74076	70 10	233	STB	10, 3	74077	04 08	277	LSB	0, 0
74077	80 10	234	STB	10, 3	74078	04 08	278	LSB	0, 0
74078	90 10	235	STB	10, 3	74079	04 08	279	LSB	0, 0
74079	00 11	236	STB	10, 3	74080	04 08	280	LSB	0, 0
74080	10 11	237	STB	10, 3	74081	04 08	281	LSB	0, 0
74081	20 11	238	STB	10, 3	74082	04 08	282	LSB	0, 0
74082	30 11	239	STB	10, 3	74083	04 08	283	LSB	0, 0
74083	40 11	240	STB	10, 3	74084	04 08	284	LSB	0, 0
74084	50 11	241	STB	10, 3	74085	04 08	285	LSB	0, 0
74085	60 11	242	STB	10, 3	74086	04 08	286	LSB	0, 0
74086	70 11	243	STB	10, 3	74087	04 08	287	LSB	0, 0
74087	80 11	244	STB	10, 3	74088	04 08	288	LSB	0, 0
74088	90 11	245	STB	10, 3	74089	04 08	289	LSB	0, 0
74089	00 12	246	STB	10, 3	74090	04 08	290	LSB	0, 0
74090	10 12	247	STB	10, 3	74091	04 08	291	LSB	0, 0
74091	20 12	248	STB	10, 3	74092	04 08	292	LSB	0, 0
74092	30 12	249	STB	10, 3	74093	04 08	293	LSB	0, 0
74093	40 12	250	STB	10, 3	74094	04 08	294	LSB	0, 0
74094	50 12	251	STB	10, 3	74095	04 08	295	LSB	0, 0
74095	60 12	252	STB	10, 3	74096	04 08	296	LSB	0, 0
74096	70 12	253	STB	10, 3	74097	04 08	297	LSB	0, 0
74097	80 12	254	STB	10, 3	74098	04 08	298	LSB	0, 0
74098	90 12	255	STB	10, 3	74099	04 08	299	LSB	0, 0
74099	00 13	256	STB	10, 3	74100	04 08	300	LSB	0, 0
74100	10 13	257	STB	10, 3	74101	04 08	301	LSB	0, 0
74101	20 13	258	STB	10, 3	74102	04 08	302	LSB	0, 0
74102	30 13	259	STB	10, 3	74103	04 08	303	LSB	0, 0
74103	40 13	260	STB	10, 3	74104	04 08	304	LSB	0, 0
74104	50 13	261	STB	10, 3	74105	04 08	305	LSB	0, 0
74105	60 13	262	STB	10, 3	74106	04 08	306	LSB	0, 0
74106	70 13	263	STB	10, 3	74107	04 08	307	LSB	0, 0
74107	80 13	264	STB	10, 3	74108	04 08	308	LSB	0, 0
74108	90 13	265	STB	10, 3	74109	04 08	309	LSB	0, 0
74109	00 14	266	STB	10, 3	74110	04 08	310	LSB	0, 0
74110	10 14	267	STB	10, 3	74111	04 08	311	LSB	0, 0
74111	20 14	268	STB	10, 3	74112	04 08	312	LSB	0, 0
74112	30 14	269	STB	10, 3	74113	04 08	313	LSB	0, 0
74113	40 14	270	STB	10, 3	74114	04 08	314	LSB	0, 0
74114	50 14	271	STB	10, 3	74115	04 08	315	LSB	0, 0
74115	60 14	272	STB	10, 3	74116	04 08	316	LSB	0, 0
74116	70 14	273	STB	10, 3	74117	04 08	317	LSB	0, 0
74117	80 14	274	STB	10, 3	74118	04 08	318	LSB	0, 0
74118	90 14	275	STB	10, 3	74119	04 08	319	LSB	0, 0
74119	00 15	276	STB	10, 3	74120	04 08	320	LSB	0, 0
74120	10 15	277	STB	10, 3	74121	04 08	321	LSB	0, 0
74121	20 15	278	STB	10, 3	74122	04 08	322	LSB	0, 0
74122	30 15	279	STB	10, 3	74123	04 08	323	LSB	0, 0
74123	40 15	280	STB	10, 3	74124	04 08	324	LSB	0, 0
74124	50 15	281	STB	10, 3	74125	04 08	325	LSB	0, 0
74125	60 15	282	STB	10, 3	74126	04 08	326	LSB	0, 0
74126	70 15	283	STB	10, 3	74127	04 08	327	LSB	0, 0
74127	80 15	284	STB	10, 3	74128	04 08	328	LSB	0, 0
74128	90 15	285	STB	10, 3	74129	04 08	329	LSB	0, 0
74129	00 16	286	STB	10, 3	74130	04 08	330	LSB	0, 0
74130	10 16	287	STB	10, 3	74131	04 08	331	LSB	0, 0
74131	20 16	288	STB	10, 3	74132	04 08	332	LSB	0, 0
74132	30 16	289	STB	10, 3	74133	04 08	333	LSB	0, 0
74133	40 16	290	STB	10, 3	74134	04 08	334	LSB	0, 0
74134	50 16	291	STB	10, 3	74135	04 08	335	LSB	0, 0
74135	60 16	292	STB	10, 3	74136	04 08	336	LSB	0, 0
74136	70 16	293	STB	10, 3	74137	04 08	337	LSB	0, 0
74137	80 16	294	STB	10, 3	74138	04 08	338	LSB	0, 0
74138	90 16	295	STB	10, 3	74139	04 08	339	LSB	0, 0
74139	00 17	296	STB	10, 3	74140	04 08	340	LSB	0, 0

Pete GERRARD'S ADVENTURE TRAIL

I'll begin a hymn of praise to the hard working Sandra Sharkey, who will soon be producing as many magazines as she has children (five so far, but only two magazines...yet). Adventure Probe has been going for some time now, a general, forum of hints, tips, solutions, anecdotes and gossip all about adventures. This has now been joined by another magazine called Southsayer, which is TOTALLY maps and solutions. Nothing else, just maps and solutions. Now I know that some of you may disapprove of this sort of thing, but if that's the case, then why do you keep writing to me for help? Personally I'm all for it, and if you want to see a sample issue of either Southsayer or Adventure Probe then send a quid to Sandra at 78 Morton Road, Highfield, Wigan, Lancashire WN3 6BT and a magical invisible wing will fly back to you before you can say Cossack Cave. Proverbs that offer you a single puzzle down the pub. Where were you at the last post-delegate meeting, eh, Sandra?

Mrs Webb of Lapped Lappers is having interesting hints for Fisty Business, where rings, courtesy of Salamander By the Way, Mrs Webb. I saw what was crossed out on your envelope, just why is a person interested in Fisty Business when the company name that was crossed out is String Manufacturing? Fish salamanders and string, oh well, this will put them in their place...

- 1) Everything around here starts under water, which is alright if you don't mind looking like a penguin.
- 2) Don't go too far from the island.
- 3) Laser pistols are really cutting weapons.
- 4) Don't be afraid of the dark.
- 5) Shellfish are great music boxes, but octopussy prefer cake.
- 6) Those castles are too far already.
- 7) Sandra should be read in the right light.
- 8) The strangest things are said behind thrones.
- 9) Ping kings aren't that dumb. Their harem are well hidden.
- 10) It's not easy being green, so be affectionate.

The harem's progress? Ought to be a date hand by now. Sorry, I said that once upon a time.

Ah... Back to the land of adventures again, and once more asked for. This time the game is Madness and Minotaur, the

person is J. Edgar of Windsor (spoiler!) wonder if he could introduce me to Lady O!, the company is Dragon Data, so here we go...

Ask the oracle

- 1) The oracle tells you what you need to kill creatures. Ask ORACLE in first out what you need, get the weapons and kill creatures.
- 2) You must TIE HYDRA with the ropes before you can kill it.
- 3) You can OPEN ORIFIT only if you are at peak strength and holding nothing.
- 4) The drapes in the room with the narcissus plants have a 50% chance of opening — you get only one chance to OPEN DRAPES each game (no taking) — this is the sort of stupid problem that should not exist in an adventure.
- 5) The spider will cause any object on the ground in its room to be randomly relocated. The rival will present this, as will placing objects in the 'music' room on the first floor.
- 6) When the 'walls glow in eerie colour' turn off the lamp and LOCK.



7) You must PLAY FLUTE in the 'music' room and hold parchment to see the ledge. Then use rope to CLIMB LEDGE to get a treasure.

8) Many hard to find places may only be reached by jumping to JUMP PIT, JUMP HOLE, JUMP POOL, JUMP MIST, JUMP UP JUMP DOWN, or JUMP.

9) Use ORKAN to learn the secret of the glowing rocks.

10) You need the FOOD (1st floor) and the MUSHPROOF (2nd floor) to learn the first spell.

11) Use VETAR to recover the lamp if it is blown out of your hands, then turn it on.

12) The UPB contains oil to fill the lamp.

13) Once all the spells are learned, some pools of oil may be found at random.

14) ARHINO will use as the search dog. A glowing room will keep you from getting hurt (just take one extra push with me on Friday nights).

15) Dirty lit rooms on the first floor may require a lamp to see everything.

16) LOCK POOL works in sea cars.

I don't know about you, but I didn't like that game at all, as it relies far too much on random events. I'm all in favour of random things happening, as they do in real life so they must in adventures, but this one was taking things a bit far. What do you think?

Letter time

Pulls a letter from the pile, and finds the name Nick Netheram staring at him. Nick lives at 27 Duke Drive, Clapham, Bedford, Bedfordshire MK43 8GL, and can offer help on the following (forward) or so adventures: Aqueduct 471, for Kinglets, Towers of Doom, Tiddies, Penelope's Tomb, Caverns of Doom, Juxtaposition, El Gableto, Dragon Mountain, Lost in Space, Cellars Island and Return of the Ring. SAC as usual.

Bartering time, folks, because Nick goes on to say "if anyone has any other following adventures I would be willing to either swap or buy them: Black Sanctum, Stonegarage, Wings of War, Monarchs of Doom, or any Scott Adams adventure". So there you go, you can barter away for your heart's content.

Two of the Scott Adams series of games were the second and third adventures that I ever played, and those were Adventureland and Pirate Adventure! Cossack Cave was the first. By the way, Anyway if anyone can cast

their minds back BDU (Before Dragon Master) to 1978 they may remember an issue of an American magazine called *Byte* which was devoted to adventures. It is therefore a complete listing, in basic for *Private Adventurer*! What would people give for a copy of that now, I wonder.

Don't all writers asking for a copy from me, because I haven't got one, it disappeared in a flouze blow, much to my intense annoyance.

Scott Adams

I think there must be two categories of people as far as Scott Adams games are concerned: in those early days, with only *Colonel Cave* to compare him against, I marvelled at how he could possibly fit an entire adventure into the computer memory of all at once. Then, as adventures progressed, it began to wonder why he didn't progress as well, even though said writer has told me that his main descriptions are not particularly ambitious. And look at things like *Phantoms*, *Militations*, and you spend most of your time digging over and over again to find unpleasant games? Okay, he might have had to pay a lot of money for the rights to the character, but dear me, *Spidevman*, too, a popular character but a not very brilliant adventure. And yet, the man did a lot of popularised adventures so we can't be too hard on him. It is essential to have a theme in behind *Infocore* we might never have had adventures on home computers at all.



Looked through rest of letters, requests for help and hint sheets, so I shall take the easy step of printing the rest of the *Spidevman* solution, since still get millions of letters about it. Well, okay, I exaggerate slightly, thousands there. Without the benefit of a wonder memory I cannot recall whether it was the November or December issue which featured the first ten steps of resolution, used in case you're wondering why I don't just look it up it's because this is being written before I've seen either of those two issues, and our beloved editor has the power to print or not to print, as she sees fit (I just put these things, I don't remember them — Ed.) up to Master's indignation and clearing the corridors. This is irrelevant to them, so don't read it if you don't want to know.

11) Go to the other main computer and look at screen.

12) Go to the transporter and enter co-ordinates for planet (see below), be sure to save game here so that it can be returned to later in the event of a disaster.

13) Go to the planet and hit off the cart.

14) Listen, and if you can't hear anything then go back to step 12, repeat, and repeat until you can hear something.

15) When there is a sound, GET COMMUNICATOR and USE COMMUNICATOR.

16) Enter co-ordinates for Emerald.

17) Get emerald and return using communicator.

18) Go to Darth Vader by the transporter.

19) Kill him.

20) Return using the communicator again.

21) Go to the lift and press the button twice.

22) Go through the forcefield.

23) THE END

Note: don't forget to breathe at places other than the safest corridor from step 10 onwards.

Co-ordinates for transporters: Planet 0-4-1-5, Emerald 2-7-3-5, Vader 1-4-0-0.

For each place enter each number by pressing that number and at the end of the row you must **PULL LEVER**.

The problem of getting lost in the large forest with the strange light is solved quite simply by not going there!

End of solution, end of game, end of column! See you next month.

PULSER SOFTWARE

36/POHILL, HIGH CHAMPTION, SHERIFF, DULHAM DL2 1NG
Telephone: (0705) 845939

UTILITIES

Mapshare	Calculus for engineering machines prices, 10 & 15 update free, update term available request.	05/04/05 £10.00 7/5 in Jan. £3.99 05 & 10/11 £6.99
Copyall	Simple 3-disk copying	Digipoints £2.99
Drawp	Free to graphics page 64k	Digipoints £1.99
Deliver	"for typing" prog, load/unload all your disk software	Digipoints £2.49
"Computer Companion"	"Computer" graphics editor	£300/box £1.49
"Di-Pac"	20 pages & 4 pictures "Requires Monitor" "Computer"	£300/box £1.99

GRAPHIC ADVENTURES

Scoring, threaded or changing display	£300/box	All times £8.49 each £3.49
Relay Adventure	100 pages & pictures With monitor "On Screen Control" feature! Organically	Digipoints £2.49

PLEASE ORDER BY POST TO R. & A. OF £1.25 p.p. (U.K.)
ORDERS (PLEASE INCLUDE BANK OF ENGLAND SOFTWARE)
SEND S.A.S. FOR FURTHER DETAILS ON ANY OTHER DISCOUNT LIST

New from PRESTON

ZOTOKA

Can you rule an island?
£2.99

ROLLA-BALL

Help the Rolla-Ball defeat the Cubes
£3.99

MUSIC MAESTRO

Enables you to compose musical masterpieces directly onto the slave, then play the music independently of the program
£4.95

R. & A. J. Preston

KINGS HALL COURT,
ST. BRIDES MAJOR,
MID. GLAMORGAN CF32 0SE
Telephone: 0656 880665

Access and Barclaycard accepted

Write: ADVENTURE

Pete Gerrard gets a game gang together

Last month we had to make problems and defeat dragons, and hence no programming. The month before that, however, I discovered we'd be talking about introducing characters into games, and now we're happy dragons once more by my side, that's precisely what we're going to be doing.

In the October issue of *Dragon User* we touched on simple, individual characters who performed simple, individual tasks. They either attacked you, or stole things from you, or perhaps solved a riddle or two for you by carrying things, accepting things, performing some task that was beyond the talents of the main hero of the adventure — you! They might have been able to reach something you couldn't or possibly they had the ability to swim across against the waves' face, but whatever it was it generally consisted of something that was pretty straightforward.

In short, they didn't really do very much, and programming that sort of character into your adventure really isn't an easy thing to do. More complicated are advanced characters or grouped characters, although I introduced the third in this issue of *Adventure Connect* (once a local adventure magazine, now moved down to Birmingham) did touch on this topic by giving us one way of having an individual adventurer (or, of course, have a group of people in the game).

However, there we had the group behaving very much as one would expect an immediate object to behave: it was refused from one room to another, and didn't really play much part in the game, other than allowing someone to merge and perhaps achieve something that would be impossible for a more conscious person roaming about by themselves.

So this month we'll be looking at more 'human' characters, or at least characters that have at least of personality about them, with perhaps a start here in the direction of having lots of characters, time and space permitting of course.

Single Characters

I'm all for making adventures as realistic as possible, and just as in real life we wouldn't expect anyone to carry more than a few bulky objects at a time, that is the best we would impose on the program. But, it doesn't seem to make sense to allow the person to carry anything else because it's holding too much. Bearing the immense load of six sheets of paper and failing to have the strength to pick up a key is quite ridiculous, as is the equally absurd situation of being able to take the mass of, say, six half-drawn-out bags of coal. So, objects are given ratings which relate to their weight. The player is given a strength factor, and as his

strength goes up and down during the course of the game he can carry more or less objects. At any time, though, the objects that he can carry have a practical limit imposed upon them: with around with five hundred sheets of paper and if you want, just one bag of coal. All of this brings us to one of the most important factors that we can give our intelligent single character, and that is the factor of strength.

Making the strength of the character stronger means that he can carry something that the adventurer can't, and thus he will have at least one thing to do in the game. Perhaps it might take two of you to carry a spectacular object from A to B: get our friend to help.

Help Offered

Intelligence, which is obviously something you'll need to solve the game, is something else that we can endow our characters with. It is, after all, one of the traditional six attributes that are imposed on players in the world of *Dragons and Dragons* and other role-playing games.

Suppose the player is faced with a conundrum. He might have to, for example, water a plant in order to make it grow, but the only thing he can find to carry the water in is a bucket with a hole in it, and however fast he runs he always finds that the water has run out before he gets there. Clearly the bucket has another purpose, since there is nothing to block the hole up to better, or is there? Something else to think about.

Instead of using the more familiar HELP routine, where the program usually prints up some menu command about not understanding you, or refusing to offer help unless you send off a postal order and take out a year's subscription to *Pigeon Pander* (I'm sorry or something just imagine all those boxes in bars, saying 'pigeons, saying 'yes, I don't feel fancy that one'), you could have the other character offering help and advice when asked. Always provided he's around, of course, and hasn't perished and fallen by being caught in a run-around with a rapidly emptying bucket of water. If he sits down and starts singing about gold, well, that's your problem.

When I say 'he', by the way this is not me being sexist or anything, I just hate writing out 'he' or 'her' all the time. Use whatever you feel like, they both have their uses! Perhaps you might like to leave it to the player to decide, and adjust everything accordingly: less strength, more intelligence, or however you want! Don't fail to write and complain at once.

Another often constraint usually imposed upon you in a role-playing game is that of clarity: hard-to-see co-ordination, that kind of thing. Thus you could easily give the player, and the character, a clarity rating, so that, for example, a player with a clarity rating combined with a character who has a clarity rating would not spot a trap until they fell in to it. But two characters who are very clear-sighted could easily spot a trap in a long row of suitably placed trees and get on with things, much more easily.

By giving the player, and any other characters who come into the game, these ratings of strength, intelligence and clarity, you make the game much more realistic, however un-realistic the setting for the adventure might be. Perhaps, instead of setting the ratings for yourself, you let the player choose them, giving him a maximum total of points to choose from. Someone might settle for lots of strength, and have little left over for intelligence and clarity, thus ending up the Dorny-out of *Crossroads*; which is certainly a fate worse than death, as I'm sure you'll agree.

Other players might opt for lots of intelligence, and end up with the tree-girdled dexterity of a banana skin. The game thus becomes far more than a simple 'solve this problem, collect that treasure' affair. The attributes for the characters in the game you would, of course, select for yourself, in adventures, as in life, you can determine those of other attributes to large extent, but you can't determine those of people, which makes the adventure, like life, all the more interesting.

You might keep those three as three distinct variables, each one being affected by the various situations encountered during a game. Eating and drinking might increase strength but decrease clarity if you overdo it. Finding a book in a library or a map on the floor might increase intelligence, and so on.

Character Building

But all of this is tons and if you don't tell the player what the character actually looks like. Saying 'a dwarf is about to be hanged here, and he's a bit of a scum' is a little disappointing (I know I'd get him in somewhere) at least makes you think of something typically dwarfish, but saying 'a man walks out from behind a bush and catches you with his name as John Smith' gives you absolutely nothing to go on apart from the fact that he looks behind a bush and pounces on unwary adventures. I'm not implying that you launch yourself into some sort of a scene of Barbara Cartland style pose-the-queen-forbid, but you should give the player some kind of impression of his new acquaintance: he might be tall and lanky, or tiny and looking like Father Christmas, short or tall, it only takes a few words to convey the necessary information.

Having done all that you're in much more of a position to give your games that certain

something that all good adventures have lots of atmosphere. It doesn't take massive room descriptions and hologram graphics to do that. Just a little of common sense and some careful programming will do the job equally well.

Balanced Talents

A realistic adventure is always going to be better (and sell more) than an unrealistic one, and one way of doing that is to look after your characters. Give them the various attributes and they become alive, playing a role part in the game, and apart from increasing the quality of the game they also allow you to set much more ingenious puzzles for the player to solve. Never make it impossible puzzles, because even if someone or whatever bizarre reason defeats an intelligence of 240, they should still be able to complete the game. You might like to consider the following: that the player selects by choosing suitable settings for your other characters. If the player decides to have no clarity whatsoever you would give the other character the ability to carve a scale model of a spider web with a diamond and a match, thus ensuring that everything remains the same overall and that every problem is therefore solvable. One thing that we haven't really touched on, and I'm sure this will be a topic dear to our beloved editor's heart, is the subject of women in adventures.

Why is it just about every adventure devoted to the male persona, and this people make because they can't think of any original problems any more? Okay, two of the mighty 16-bit male adventures gave you the opportunity to control a female heroine, and the game adjusted itself accordingly. Or at least I hope so, playing as a female I never made it to the villain's lair or home of the game!

But generally speaking, a typical adventure casts the heroine as a male of the Rambo

(I can't spell Arnold, what's wrong with me!) variety, and I'm, sure there's mileage to be had in exploring the female side. And not just as the kind of female that adventure uses when promoting Barbarian-type games either: Marie Whitaker might earn her money as much as the prime minister, but then (as the Mail on Sunday put it) she's got five times as much on her front beach. Many people find that sort of image offensive, and just as not all male adventures look like Arnold so not all female ones look like Marie.



Conclusion

I haven't quoted somewhere that around 30 per cent of adventures are for women. Where they get these figures from I have no idea, but there you go. I've off about games again - did I? (I was there obviously and if female interest out there, and as I said I would give you some new problems to ponder rather than the usual adventure scenarios. I must be suggesting that you go on an out and out feminist campaign, but it would make a change. Orwell, having no doubt stirred up a hornet's nest I shall tread quietly from the scene until another month is by. There we'll get back to adding a few verbs to our adverbs, and give you another insight into how a game is put together. Plenty to think about, in terms of characters (male or female) (other about Luggan?) is this man an object?) so until then, goodbye.

CLASSIFIED ADS

DRAGON 32. Perfect. Tape recorder, video, joystick, many tapes. Delta Dec. Offers to T.J. Haidbreil, 14 Loozer Lane, Lanting, West Sussex. Tel: Worthing (0402) 52427.

FRENCH Dragon 64 research (graphic) label and contacts. Serge Curren, 208 Rue Jules Guesde, 59210 Croixvaux, France.

DRAGON 64. Joysticks, software, books: £25. Tel: Norwich (0603) 736076.

HOUSE MOVING SALE. Everything surplus must go! Unlimited Dragon 32s: £28. Superdisk controller £4: £55. (Plus postage). 3441 Tel: Tel. Mr Sparks, 114 Queensway, Tisbury, Wiltshire, Kent TN2 3JH.

DRAGON 64. Disc drive, Flex CDS, light pen, recorder, many tapes, discs. Any offers. Tel: (0703) 442282.

DRAGON 64. 2 drives, Superdisk, Address editor/ assembler, £185. Dragon 32, £28. Printer control, debugger, books, all as new and boxed. Tel: Wakeup 248223.

DRAGON 64. Delta disc controller, Dragonides compatible controllers, disc drive, SERVON CD-R packages, lots of other software (free and tape), magazines, etc. Mayfly, £295 (incl. Tel: 01743 23737 - John.

DRAGON 32. Joysticks, books, cassette recorder, magazines: £100. Software £400. DRG. Hereford. Tel: (0432) 263476.

HERE'S MY CLASSIFIED AD

(please write your copy in capitals on the lines below)

Name

Address

Tel:

Classified rate: 50p per word.

Please cut out and send this form to: Classified Department, Dragon User, 10-13 Little Newport St, London WC2N 7PP.

DISC DRIVE CONTROLLER FOR DRAGONS

fully compatible with DragonDos only £79.95 inc. of VAT & post

Disk drives also available

Complete Systems from £159.95

Please enclose S.A.E. with any enquiry
Dragon 32 available £49.95 complete.
Quaranteed 90 days.

PMP Communications

Unit B, The Old Boat Yard, Robinson Road,
Newhaven, East Sussex BN9 9SL.
Telephone (0323) 514791

CPH

you to calculate the number of bytes yourself (BANK * -20, for example), but the easy way is to always give the destination instruction address and a branch offset. This way, the assembler calculates the number of bytes between the destination and the branch instruction for us — and then change the number of instructions between the two locations. A re-assembler automatically generates the revised value whereas if we wish to be the computer and assemble each `if + n` or `if -` form, we need to check and re-evaluate new values prior to each assemble.

There is a limitation on the distance between the branch and destination of +107 and -128 bytes from the end of the 2 byte branch instruction (i.e. start of the instruction following the branch). However, this does not limit our program capability as if greater distances are involved (and the assembler will usually flag an instruction as an error if the distance is exceeded), all the branch instructions may be prefixed with L, for Long, (LONG JUMP).

etc). These allow two bytes for the +1 value, allowing distance of +32767 and -32768 bytes to be reached — which, as the total memory of an unmodified Dragon is 65536 bytes enables every possible location to be reached.

We have mentioned + and - numbers here, which is where "signed" and "unsigned" values come into focus. However, if that's going into detail at this point, the Editor's guideline will come into greater focus. So, really, further detail will have to wait until next month.

Workout

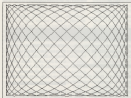
Meanwhile, as programmers, we need to protect our programs from operator misuse, either accidental or deliberate. The PRINT `g`-code above contains a weakness that can be exploited by a user — have you found it? There is a check in the \$B000 routine that prevents the display of the left arrow causing the text pointer to fall down below address \$400. However, in the PRINT `g`-355 version, have you tried left

arrow beyond the amount of data you have already (if any) input then carried out further keypresses? To prevent this, we must decide either not to allow use of left arrow for measure (unfriendly) or to insert our own check that if left arrow is received, only allow it to be displayed if + or - (if there is data to be added) (current pointer contains value > \$B000). The CalcPare instruction cannot directly compare the contents of a single double byte with another memory location or actual value; one or other value must be in a register. We do not want to consult the contents of register A prior to knowing whether it is to be displayed or ignored, so register D should not be used for the compare; use register X. By adding in instructions to the PRINT `g`-355 version to both prevent use of left arrow for measure and a further version to allow use of left arrow for measure but to prevent against backspacing beyond \$B000.

Next month, at last, we will make a start on building programs that won't run on our machines because of their position dependency.

Down in the dumps

Dragon User presents a screen dump for the Memotech DMX80



LINE 50 resets printer. Clears any commands you have already given it.

LINE 60 sets printer to "Emit" mode, otherwise you get oval circles.

LINE 70 Standard bit image designation command.

LINE 80 to 100 collects the data from each row across the screen. 8 pixels high.

LINE 110 set line feed to BYT2 inch, to get no gaps between the rows, and then gives the line feed command.

LINE 120 instructs the next line to be scanned or, if the whole picture is complete, ends the program.

\$B50 is very good for screen dumps because it is so easy to alter to suit your own particular printer. As far as I know, the Memotech is almost the same as the Panasonic and some Sanyos, so hope this dump is going to be useful to quite a few Dragon owners.

Although this dominates 5 minutes (providing your Dragon can handle lines 40 and 100) to do the job, the beauty of it is that it can be altered so easily.

```
10 *SCREEN_DUMP - MEMOTECH DMX80
20 *PRICE TOWNSEND - (C) - 4/6/87
30 MODE4,1:SCREEN1,0:Y=0
40 FMODE$495,0
50 PRINT#2,CHR$(27);"M";
60 PRINT#2,CHR$(27);"M";CHR$(0)
70 PRINT#2,CHR$(27);"K";CHR$(0)
80 FMODE$495,0
90 FMODE$495,0
100 A=PPRINT(X,Y):L28=PPRINT(X,Y+
110 L28+PPRINT(X,Y+2):L32=PPRINT(X,
120 Y+3):L36=PPRINT(X,Y+4):L40=PPRINT(X,
130 Y+5):L44=PPRINT(X,Y+6):L48=PPRINT(X,
140 Y+7)
150 PRINT#2,CHR$(15);NEXT
160 PRINT#2,CHR$(27);"A";CHR$(0)
170 PRINT#2,CHR$(10)
180 Y=Y+8:IF Y>19 THEN 130 ELSE 70
190 FMODE$495,0
```


Happy New Year

Gordon Lee can't even get to 1988 without making a puzzle out of it . . .

WHenever the competition involves using numbers greater than those that the computer can normally handle, inevitably creative lots of letters from readers reporting that their attempts and/or an overflow error stopped the computer. So here is a step-by-step introduction to the method that the Dragon can use to perform calculations on numbers with hundreds (or even thousands) of digits.

First of all it is necessary to understand the limitations of any machine. Ask it to multiply 7654321 by itself and it will display the correct answer, but try to multiply this same number by itself, and the answer given is only the approximate value 5.824420E+13. The E+13 is the computer's way of indicating that the decimal point of the displayed value must be moved thirteen places to the right giving a 'real' value of 58244200000000. This does not mean, of course, that the true answer ends in seven zeros, merely that the computer can only handle a relatively small number of digits with absolute accuracy. It is possible to store a few more digits out of the computer as the internal registers contain more digits than are displayed on screen, but these cannot be relied upon to be accurate. The calculations, therefore, should only be regarded as correct to about nine significant figures. On practical level this would, for example, allow you to measure the length of the equator to an accuracy of a few feet — but in mathematical theory (and some of our competitors this isn't enough).

One way of overcoming this problem is by using string variables to hold the digits being operated on. Clearly, it is not possible to multiply, divide, subtract, or, in the mathematical sense, add strings, but by converting

each digit to a numeric variable as it is required, large computations can be made. There is nothing complex in the mathematics either — the method being to simulate that used in the 'pencil and paper' way of performing the calculation. Let's take a simple example of multiplying 987654321

by 4. Mathematically, we would take each digit in turn, starting at the right hand end, and multiply it by 4. Any product greater than nine would result in a 'carry' which would be taken care and added to the next stage of the calculation. Now look at listing one which performs the calculation using this precise

Listing 1

```
10 AS="987654321" LB=4:CB="":CARRY=0
20 FOR P=LEN(AS) TO 1 STEP -1
30 V=VAL(MID(AS,P,1))*CB+CARRY:CARRY=0
40 IF T>9 THEN CARRY=INT(V/10):V=V-CARRY*10
50 CB=RIGHT(STR(V),1)+CB
60 NEXT P
70 IF CARRY>0 THEN CB=RIGHT(STR(CARRY),1)+CB
80 PRINT CB
```

987654321	.....	AS
3950617284	.....	BS
64181691586	.....	LS(1)
14258153668	.....	LS(2)
49903537838	.....	LS(3)
57033614692	.....	LS(4)
14258153668	.....	LS(5)
7129076834	.....	LS(6)
21387230502	.....	LS(7)
42774461004	.....	LS(8)
49903537838	.....	LS(9)
14258153668	.....	LS(10)
19498557611271763986	.....	2S

Prize

It's a while since we had an adventure up for offer on the Puzzle Page. John Smallwood, author of the adventure *Larkspur Wizard is Trapped*, has offered us five Larkspurs, and a set of discount vouchers to another 15 lucky winners of *John's Christmas*.

Rules

AS soon as you have made it across the gap from 1987 to 1988 (in fact, if your DV gets there on time, you can do it between the turkey and the pudding, if that's how you see your merry and dead), settle up a printout, tell us your answer (don't let what someone did last month or else) include the listing without an answer attached to it, with any program notes you want (don't be mean, complete the marker, and make a note on a separate sheet (JAGUARY) CCAMEY MINCE to the usual address.

For the illustration, I want you to write another version of *Angels* or come one, be late, any other piece of Yuletide music

which has really been driving you up the wall recently, if only needs to be two lines, but it must be in keeping with the spirit of the festive season, whatever you perceive that to be.

October winners

This proved a popular competition and we saw a higher-than-usual number of new faces among the entries. We also had a high proportion of correct entries, but boy, it's a good thing we don't deduct marks for mistakes (or whatever the opposite is, Healers?).

The winners are: Robin Telford of Sale, John Smallwood of Preston (we agree next month and save yourself a few bob, John), C. H. Barber of Swale, Denis O'Malley of Cumbernauld, William of Bedford, Fred Wilkes of York, David Wilson of Denmark, J. Smith of Tynsted, Alan Thomas of Southend, Phil Sapiro of Liverpool, Austin Henderson of Bournemouth, D.J. Gley of Middlesbrough, Mark Tinsford of Long Eaton, C. Hutchinson

of Middlesbrough, S.A. Siddons of Clewley, Nils Lindgren of Sweden, E.A. Newman of Adelaide, Don Robertson of Essex, I.J. Huggins of Casperbury and Randy Longshore (that is, unless in Sins-dans, Randy, but we don't take the record for your first name yet) of California.

There were quite a few good illustrations, including a short poem from Randy, having personal favourites: "I go to work on an egg because the opposite always gets stuck in a jar" from I. Huggins, *Best Laid Note* from Alan Newman, who means that the Penelope had stuck into his Dragon and deleted his original solution. Anything to keep them away from Star Wars, Otter.

The prizes for the October comp were a batch of Checker Apps and Screening Advice kindly donated by Harry at Computape, one of the Dragon's longest serving, and most consistent supporters. See you at the Show, Harry.

Solution

This month's solution should be opposite

method but arranged into a program which the computer can handle. Line 40 stores the nine-digit number in A5, and the digit by which this is to be multiplied in the numeric variable B. The final product will be stored as a string Z5, initially defined as an arbitrary, and any "carry" in the appropriately named variable, again initially set at zero. Thereof three 20 to 400 places each digit is taken from the right hand end of A5, multiplied by B and the "carry" (if any). Note that since the carry is added it is reset to zero. The value of this individual calculation is checked to see if it is greater than 9 — let's call it here is a carry to be taken on to the next stage. This is done at line 40 which also gives a revised value for V its carry made. Finally, the resulting digit is converted to string format and is appended to the left hand end of Z5, thus building up, digit by digit, the final product.

Dragon ghost

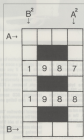
The only irregular command in this listing is the use of the `PRINT` instruction in lines 46 and 70. Regular readers of this column will realise that this is because of the "ghost" blank character which the Dragon possesses on the left hand end of any string variable created by use of the `PRINT` command. Once the left hand digit in A5 has been reached it is then necessary to append any "carry" (if there is one), so that the final result is now held in Z5. It is important that this listing, and the theory behind each of the instructions, is understood before considering the next stage — that of the multiplication of two large numbers.

Figures are multiplying multiplication of two 10-digit numbers, much as it might appear (theoretical longhand). By modifying listing one it could be an easy matter to store the second 10-digit number as string Z6, and

then take each digit in turn from this second string and multiply in the manner already outlined the value held in A5. The resulting sub-products could then be stored, for example in an array, before being finally totalled up to give the final result. The disadvantage of this is that memory needs to be used simply to store all of these sub-products until the final totalling.

1000 bytes

In the example given this is not a problem as there are only ten lines of digits each con-



taining ten or eleven digits, but if the numbers being multiplied contained a hundred digits, it would be necessary to reserve 10,000 bytes of memory for this purpose. The way around this is to add each digit as it is computed immediately to the appropriate digit in the final product (Z5). In this way the space used for the array can be eliminated and the only memory you reserve string memory for the two numbers, being multiplied, and the final product. In the case of the two 100 digit numbers mentioned, this would only tie up 400 bytes — quite a saving on the 10K which would otherwise be necessary.

As an example of how this would work take the third column of digits from the right in the long multiplication shown. Here we have to add the digits 5, 8, and 8. The sum of 21 means that the first will appear as the third digit from the right in the final product, and a 1 will be carried over to the fourth position. This carry will be the total of 1, 8, 3, and 2, plus the 1 carried, giving a final digit 3, with, again, 1 to carry.

In order to do this we need to initially define Z5 as a string of zeros long enough to contain the final product, and to have a means of knowing the position within this string to which each individual digit must be added. Next month we will be taking a look at how this can be achieved.

Competition

To commemorate the start of the new year, this month's competition is a crossnumber puzzle based on the year which has just ended, 1987, and one which has just begun.

In the grid below these two dates have already been entered. What you have to do is find the words A and B such that they, and their squares, can be fitted into the grid.

The Answer

This is Gordon Lee's own solution to the November competition — see page 26 for results

ANSWERS: the boxes should be filled as follows:

- (a) Triangular square: 36, 1225, 4900
- (b) Triangular hexad: 10, 100, 1540
- (c) Triangular pyramid: 35, 91, 20035
- (d) Square cubic: 64, 729, 4096
- (e) Square tetrahed: 4, 19600
- (f) Square pyramid: 4900

SOLUTION: The competition was related to the relationships between the five main types of figure numbers. As was stated, certain of these have been proved to be impossible, and one — a tetrahedral number which is also pyramidal — although not disproven, is extremely unlikely. If such a number exists it will be very large.

The list above in sections a to f gives, in each case, the three smallest numbers (not counting 1). Sections a and f show the only possible answers that exist — a fact which has been proved mathematically.

The listing given compares two types of number and examines the relationship between them. Numbers which correspond are printed out. In the example given the

squares and triangular numbers are being compared. Starting with A=1 and B=1, each pair of figure numbers is generated in turn. The logical method would be to generate one of these figures in turn and then test a series of the other type of number to see if the two values match. This would result in a lot of duplicate working by the computer so a much quicker method is used here. Note that TA is the value produced from A by formula 1, and TB is the value produced from B by formula 2. These two values are compared. If TA is larger than B is increased

before the next test. If TB is larger than A is increased. In this way the higher orders of figure numbers can be tested without any duplication as the values "leapfrog" over each other in turn. If two values are found which match, the result is printed out as these values are what we are looking for. When this happens, one of the generating values is incremented and the search continues. Inter-programming A which is increased but B which is equal will have been B.

By changing the formulae in lines 20 and 30, the different relationships can be tested.

Listing A

```
10 A=1:B=1
20 TA=A*(A+1)/2:REM Put Formula 1 here
30 TB=B*B:REM Put Formula 2 here
40 IF TA=TB AND TA<1 THEN PRINT A;"
";B;" " ;TA
50 IF TA>TB THEN B=B+1:GOTO 30
60 IF TB>TA THEN A=A+1:GOTO 20
70 A=A+1:GOTO 20
```

Dragon Answers

If you've got a technical question write to Brian Cudge. Please do not send a SAE as Brian cannot guarantee to answer individual enquiries.

ROM can't be a RAM

I need a RAM pack for my Dragon32 (only 8K is needed). Is it possible to remove the fast approx. 1000 byte (fast access cartridge) and insert two 64K RAM chips to make 128K or 256K RAM?

Are there any RAM packs for 8K available on cartridge?

Phil Collaghan
34 Portland Road
Moss Pit
Stafford

UNFORTUNATELY you cannot simply replace a ROM chip with a RAM chip, as the cartridge does not have all the necessary read/write circuits needed for RAM. It is certainly possible to attach extra RAM to cartridges forming all of the important ROM pins on the cartridge port. The problem is that no one seems to make this (obvious) product for the '32 — unless one of our readers knows differently!

Binary coded decimal

I have recently started to write BBC assembler and have come across 'binary coded decimal' in some time manuals I have. Could you explain what this is and what it is used for?

Chris Fields



8K of space have been it isn't really practical to give a full blown explanation of Binary Coded Decimal (BCD), but I'll try and give you the absolute basics.

Normally, one byte stores a number from 0 to 255 using eight bits. In BCD the byte is divided into two four bit 'nibbles' which can each hold a number between 0 and 9 (the values 10 to 15 are not used in BCD).

For example, the number 42 would be stored in the following way in binary and BCD:

Binary: 00000011 — 64+0+1 = 67
BCD: 00000111 — 4 (binary) and 2 (BCD)

Binary Coded Decimal was originally intended for use where exact precision was required, but as

obvious applications for us including and updating scores in a machine code game. If you use standard binary, then converting this into ASCII screen characters is not very simple, however, a BCD byte can simply be converted as follows (assuming BCD score is in B register): (see listing one).

A special instruction 'BAA' exists to adjust the accumulator after a BCD addition. So to add 5 to the score (again assuming the BCD is in B), the following routine could be used: (see listing two).

Of course, only numbers between 00 and 99 can be stored in a BCD byte. I suggest you look at Programming the BBC to C for more information on BCD.

Maplin muddle

COULD you help me with a problem I have interfacing the Maplin Dragon 32 MO carrier to my Dragon 84? The instructions put the operation of this module in BCD, but I don't seem to be able to make the module work on my '84. I would appreciate your comments.

A. Ahmed
Kilwin Collage
Kilwin Road
Birkbecker
Middletown
W. Yorks

THIS was a problem which I have come across before (see enhanced cartridge I reviewed a few years ago). On the Dragon 32, it is possible to interface an I/O port at address 20000 with minimal dressing. However, as the '84 the address select circuit is more complicated and I/O ports must be fully address selected using all 16 bits.

The problem seems to arise in circuits designed for the Dragon 32 before the '84 was released. Although valid for the '32, this 'quick and dirty' decoding will not work on the '84.

The sharps from the flats

I have a copy of the 'Composer' program for my Dragon which I bought second hand. Also, I have no manual for this. I think I have just about to know the whole system, but although I can enter sharps in the data statements (e.g. 'A' seems to do the trick), I cannot find how to enter 'flat' or 'double dotted' notes. A single dot works for a dotted note, but '...' does not work for double dotted. Can you help?

David Lane
Farm Cottage
Donisthorpe
A. Lincoln

A flat note is denoted by an underlined sharp after it (eg. A_b) as is another way to a sharp note (eg. C_#). Double dotted notes are marked with a colon (eg. A::) at the end of the line.

PSCOR	TFR	B,A	
LSRA			* Get upper nibble
LSRA			
LSRA			
LSRA			
ORA	#48		* Convert to ASCII Code
JRR	PRT		* Print the char in A
TFR	B,A		
ANDR	#15		* Get the lower nibble
ORA	#48		* Convert to ASCII Code
JRR	PRT		* Print this digit
RTS			
INCSC	TFR	B,A	* Get score in A
ADDA	#5		* Add 5 to it
ORA			
TFR	A,B		* Put back in B register
RTS			