screens and other sophistications, but these are hardly fair criticisms for a package in this context, so I will not dwell upon them.

However, it does also lack a few features of basic human engineering which, if present, would greatly contribute to user-friendliness. For example, there is no command to clear the spreadsheet, and there are no instructions on how to do it, either. In fact the spreadsheet can be fairly quickly cleared by exiting then re-running, a matter of a few keystrokes. Another source of annoyance was that it was impossible to abandon a menu option once selected, for example, once replication is selected you must go through with it, even if you hit the wrong key by accident. Also for some reason, the delete key did not operate in text entry under the menu options.

Although it is difficult to run out of memory before every cell available is in use, it would appear that there is no proper error-recovery if this does happen. When running the calculation benchmarks, the system simply 'died' if too many formulae were entered.

Of course more extensive arithmetic and faster recalculation times would also be desirable, along with improved editing facilities and row and column deletes. Particularly lacking was a flexible formatting facility. If working with small quantities it could be possible to squeeze four or five spreadsheet columns onto the display, but with ECalc's fixed column widths there is no facility to do this. Obviously, with just 16k of RAM, the implementors had to draw the line somewhere, since lots of facilities would mean no room for spreadsheet!

The manual

The manual is well presented: 32 glossy pages with information on getting started, basic facilities, several tutorial examples and an index. Most of the instructions give a key by key account of what to do with all the keystrokes given in emphasised type, and keystrokes using special keys (like 'control' and 'return') printed in inverse, white on black. This is not quite as effective as it could be since emphasised type is also used wherever the product name appears, and in other instances as well. Thus it is still necessary to hunt through the text for which keys to use. Most of my initial problems with cassette loading stemmed from being unable to find information that was *actually* there, but obscured by inconsistent typefaces.

The content of the manual is passable, but not as clearly written as I would have liked. Possibly it lost a little elegance in its translation from Japanese, or alternatively it's always been in English but was not brilliantly written in the first place! Certainly it's better than some Japanese translations, in fact better than Epson's own printer manuals, but I did find it necessary to re-read most of the instructions before I could mentally digest them.

There are several tutorial exercises, including a December cash-flow problem for a certain Mr Fawkes of the 'Big Bang Firework Co' — a refreshing change from the 'Acme Widget' example that seems to pepper most of the American manuals.

Conclusion

Frankly, I was a little disappointed with ECalc. Of course, knowing the hardware limitations of the HX-20 I was not expecting a product in the Multiplan class (reviewed in *PCW*, April 83), but it would not be going into the realms of fantasy to expect a greater range of arithmetic functions and a more respectable calculation speed. After all, the HX-20 does have an excellent Basic interpreter written by Microsoft — fully equipped with all the usual trigonometry and arithmetic functions. So all that software is already there, just waiting for connection to a spreadsheet system, and Epson failed to make use of it.

Curiously enough, I was not greatly troubled by the small scale display. Obviously a bigger display would be preferable, and Epson have plans for an external 32 by 16 character add-on, but it certainly did not render the system unusable. A particularly nice feature was the ability to move the cursor during formula entry, thus enabling the right cell reference to be found even if it was off-screen at the start of the formula entry.

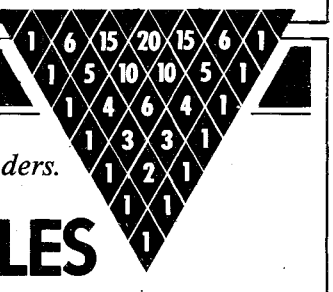
The integral narrow width printer (24 characters) was just about adequate to the task, but a fair bit of cutting and pasting would be needed to fit together a wide report. As compensation, the HX-20 has good facilities for connecting to larger external printers and ECalc itself can optionally make use of them.

After some initial teething troubles the cassette behaved itself very well, with some fairly sophisticated facilities for loading and saving the spreadsheets, and at quite a reasonable speed (for a cassette) as well.

So all things considered, Epson have succeeded in implementing a usable spreadsheet system on their hand-held portable computer. It's a system that can support only fairly lightweight applications, partly because it's on lightweight hardware (for which the implementors cannot be blamed), and partly because of the software design (for which they can). Nonetheless, hand-held micro owners are not exactly spoilt for choice in this area at the moment, and so ECalc should prove of interest to the growing band of HX-20 users beavering away on buses, planes and trains.

END

NUMBERS COUNT



Mike Mudge presents another batch of mathematical mind-benders.

n-TUPLES OF ASSOCIATED n-TUPLES

A triple of positive integers is defined to be (a,b,c) where a, b and c are chosen from 1, 2, 3,... The order of occurrence of a, b and c is not significant.

Two such triples are said to be associated if they have a common sum a + b + c and also a common product a x b x c. We shall write, for example, (14,50,54)(a)(15,40,63) since 14+50+54=15+40+63=118 and 14x50x54=15x40x63=37800; (a) being read 'as associated with'.

Computational problems

(i) Determine the smallest common sum of four associated triples. Believed to be 118.

(ii) Determine the smallest common product of four associated triples. Believed to be 25200.

(iii) Discover any quintuples of associated triples. (6,480,495)(a)(11,160,810)(a)(12,144,825)(a)(20,81,880)(a)(33,48,900).

(iv) Investigate empirically the existence of larger sets (n-tuples n > 5) of associated triples.

(v) Investigate empirically the existence of n-tuples of associated m-tuples for computationally feasible m and n.

Note: There are mathematical problems relating to infinite families of associated triples such as:-
(16ka,bc,15d)(a)(10ka,4bc,6d)(a)(15kb,ad,16c)(a)(6kb,4ad,10c) where a = k + 2, b = k + 3, c = 2k + 7, d = 3k + 7, k = 1, 2, 3, ... due to J G Mauldon but these are essentially outside the scope of this article.

Readers are invited to submit a program, or suite of programs, which investigate the above problems. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A prize of £10 will be awarded to the 'best' entry received.

Entries, to arrive by 1 September, to: Mr M R Mudge BSc FIMA FBCS, Room 560/A, Department of Mathematics, The University of Aston in Birmingham, Gosta Green, Birmingham B4 7ET.
Note: Submissions will only be returned if suitable stamped addressed envelopes are included.