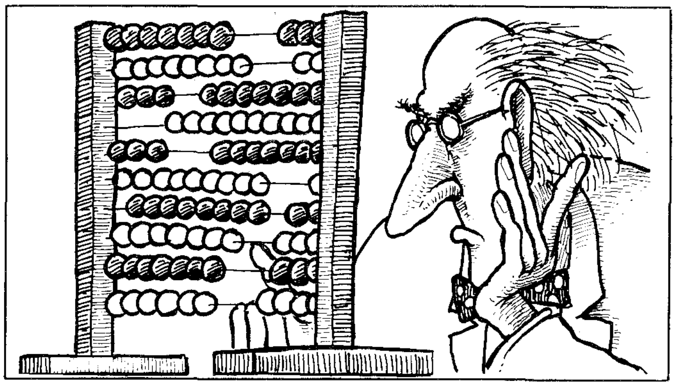
DIARY DATA

A guide to forthcoming computer shows. Readers are advised to check details before setting out on their journey.

ELECTRON & BBC MICRO USER SHOW UMIST, Manchester — Database Exhibitions (061) 456 2991	**18–20 March 1988**
ELECTRONIC PRINTING AND PUBLISHING EXHIBITION Olympia, London — BED Exhibitions (01) 948 9900	**22-24 March 1988**
COMPUTERS IN RETAIL AND RETAIL TECHNOLOGY NEC, Birmingham — Focus Events (01) 834 1717	**29–31 March 1988**
COMPUTERS IN TRANSPORT AND DISTRIBUTION Wembley Conference Centre, London — Computers in Transport and Distribution (0303) 45979	**19–21 April 1988**
ATARI COMPUTER SHOW Alexandra Palace, London — Database Exhibitions (061) 456 2991	**22–24 April 1988**

NUMBERS COUNT

Mike Mudge returns to the popular topic of prime numbers including reference to recently published results.



Definition Denote by p(n) the number of prime numbers not exceeding n. Thus p(1) = 0, ( ); p(10) = 4, (2,3,5,7); p(100) = 25, (2,3,5,7, . . . 79,83,89,97).

The state of the art

EDF Meissel (*Math Ann* 1870, vol 2, pp636–642; 1871, vol 3, p525; 1885, vol 25, pp251–257) calculated and published p(10) = 664579, $p(10^8)$ = 5761455 and $p(10^9)$ . . . which remained the largest published result until 1959. In that year DH Lehmer (*Illinois Journal of Math* vol 3, pp381–388) corrected $p(10^9)$ (the value calculated — by hand — by Meissel being too small by 56) and published $p(10^{10})$ (in fact, too large by 1).

In 1986 P Shiu (*Math Comp* vol 47, pp351–360) published $p(10^{11})$ and $p(10^{12})$ while JC Lagarias, VS Miller and AM Odlyzko (*Math Comp* vol 44, pp537–560) calculated $p(4\times10^{16})$ using approximately 30 hours processing time on an IBM 3081 Model K.

It is clear, therefore, that *PCW* readers should not feel encouraged to extend the range of values of p(n) beyond 4×10^{16}.

Problem

The computing problem associated with p(n) which follows is formulated in such a way that it tests the skill and ingenuity of the programmer rather than the speed and word length of the computer, the efficiency of the compiler or the choice of language.

How many basic operations do *you* need to compute p(n) for a given n? In particular, for n = 10, 100, 1000, 10000. *Note* It is recommended that an algorithm is detailed, coded and checked, then an operation count carried out. If possible, the fundamental operations of arithmetic should be separated into + − * & / and, in turn, separated from logical operations. It is thought inadvisable to attempt this count from the algorithm at its pencil and paper stage. Readers may feel differently! If such a count seems too laborious, an alternative measure of efficiency may be supplied in the form of ratios of times taken to evaluate $p(10^n)$:times taken to evaluate $p(10^{n-1})$ as a function of n.

As and when multiprecision arithmetic becomes essential, many readers will feel that they are excluded from entry . . . but rest assured an efficient algorithm developed within the normal arithmetic precision of the computer is likely to remain efficient when combined with suitable arithmetic multiprecision routines which may not be immediately available.

Changing the subject:

A Nearly Pattern involving Palindromic Squares

In February 1985 a study of palindromic numbers (reading the same way backwards and forwards) produced the record ever response to a 'Numbers Count' article. Thus it seemed appropriate to quote the result (see Fig 1) of JKR Barnett (*Bulletin IMA*, vol 23, Nos 6/7, June/July 1987 pp100–101).

9	$= 3^2$
94249	$= 307^2$
942060249	$= 30693^2$
9420645460249	$= 3069307^2$
94206450305460249	$= 306930693^2$
942064503484305460249	$= 30693069307^2$
9420645034800084305460249	$= 3069306930693^2$

Fig 1

Now construct the eighth member of the sequence of squares appearing on the right-hand side. It is nearly, but not quite, palindromic! Why?

Readers are invited to send their attempts at eighter, or both, of the above problems to Mike Mudge, 'Square Acre', Stourbridge Road, Penn, South Staffordshire WV4 5NF, to arrive by 1 June 1988.

It would be appreciated if such submissions contained a brief summary of results obtained, in a form suitable for publication in *PCW*. These submissions will be judged using subjective criteria, and a prize will be awarded by *PCW* to the 'best' contribution received by the closing date.

Please note that submissions can only be returned if a stamped addressed envelope is provided.

Mike Mudge welcomes correspondence on any subject within the areas of number theory and other computational mathematics. Particularly welcome are suggestions, either general or specific, for future Numbers Count articles; all letters will be answered in due course.

Isolated readers can be put in contact with others sharing the same interests. However, greater efficiency regarding published problems should result from contacting the prizewinner.