Pseudo*Skills

Pseudo*Sequences (according to Florentin Smarandache) and Generalised Russian Multiplication, presented by Mike Mudge.

The problem areas this month have an absolute minimum of mathematical prerequisite and are published to support a request from some readers in the USA for "addresses of editors, mathematicians, etc. who may be interested in our publications." There is, however, considerable scope for programming skills and it is possible that the algorithms constructed may yield results that require sophisticated algebra for their full interpretation.

PROBLEM A

Background reading: Only Problems, Not Solutions! by Florentin Smarandache; ISBN 1-879585-00-6, Fourth Edition, 1993, Xiquan Publishing House, c/o Dr. R. Muller, Box 42561, Phoenix, Arizona 85080-2561, U.S.A.

A number is a PSEUDO*PRIME, in the sense of Smarandache, if and only if some permutation of its digits is a prime number.. including The Identity Permutation.. thus all PRIMES are PSEUDO*PRIMES but the converse is not true.

PSEUDO*SQUARES, CUBES etc; PSEUDO*FACTORIALS; PSEUDO*ODDS/EVENS; PSEUDO* TRIANGULAR; and PSEUDO* (MULTIPLES of n) are similarly defined and discussed in the above reference.

Given any sequence of integers called, say S(n), construct an algorithm to generate the PSEUDO*S sequence and output this as an ordered sequence of integers.

Example: The PSEUDO*SQUARES begin:
1,4,9,10,16,18,25,36,40,46,......... 961,972,982,1000,...

Also, the PSEUDO*MULTIPLES of 5 begin:
0,5,10,15,20,25,30,35,40,45,50,51,52, ...

The instructions given by F. Smarandache are " Study this sequence." What would this mean to a *PCW* Numbers Count reader?

PROBLEM B

Background reading as in A above.

A NATURAL SEQUENCE, in the sense of Smarandache, is a sequence of positive integers, n, where each n is repeated f(n) times for some given function f. For example:

(i) If $f(n) = 2n + 1$ then between n^2 and $(n+1)^2$, the latter excluded and the former included, there are $(n+1)^2 - n^2$ different numbers, Here $s_q(n)$ is the superior integer part of the square root of n.

(ii) If $f(n) = 3n^2 + 3n + 1$ then between n^3 and $(n+1)^3$, the latter excluded and former included, there are $(n+1)^3 - n^3$ different numbers. Here $c_q(n)$ is the superior integer part of the cube root of n.

(iii) If $f(n) = (n+1)^m - n^m$ we find that $m_q(n)$ is the superior integer part of the m^{th} root of n.

Investigate these sequences when f(n) is specified above and for other functions f(n).

Suggestion: following upon empirical analysis, with graphical support, obtain algebraic expressions for the sum of m terms of such sequences.

PROBLEM C

Background reading: Some Notions and Questions in Number Theory, by C. Dumitrescu and V. Seleacu, 1994, Ehrus University Press, Department of Sciences, Box 10163, Glendale, Arizona 85318, U.S.A.

Smarandache Multiplication

Another way to multiply two integer numbers, A and B: ...let k be an integer greater than or equal to 2; write A and B on two different vertical columns: c(A) and c(B) respectively... multiply A by k, and write the product A_1 on the column c(A);.. divide B by k, and write the integer part of the quotient B_1 on the column c(B);... and so on with numbers A_i and B_i replacing A and B until we get a B_j less than k on the column c(B); then... write another column c(r), on the righthand side of c(B), such that for each number of column c(B), which may be a multiple of k plus the rest r (where r = 0,1,2..k-1), the corresponding number on c(r) will be r;... multiply each number of the column A by its corresponding r or c(r), and put the new products on another column c(P) on the righthand side of c(r);... finally, add all the numbers of column c(P) to obtain the product AxB.

Remark: Any multiplication of integer numbers can be done only using multiplication with 2,3,...k, divisions by k, and additions. When k = 2 we recover the so-called Russian Multiplication, known to the ancient Egyptians.

Implement Smarandache Multiplication on a computer, with particular attention to the layout of the columns c(A,B,r,P) described above.

PROBLEM C* From an understanding of the algorithm construct a parallel process for division by k^n where k and n are integers greater than or equal to 2.

Remark: Any division of an integer number by k^n can be done only by divisions by k, calculations of powers of km multiplications with 1,2,3,..k-1 and additions.

Complete or partial responses to the above problems may be sent to Mike Mudge, 22 Gors Fach, Pwll-Trap, St. Clears, Carmarthen, Dyfed SA33 4AQ, tel 01994 231121, to arrive by 1st October 1995. Any complete or partial solutions received will be judged using suitable subjective criteria, and a prize in the form of a £25 book token, or equivalent overseas voucher, will be awarded by Mike Mudge to the "best" solution arriving by the closing date. Such contributions should contain a brief description of the hardware used, details of coding, run times and a summary of the results obtained; all in a form suitable for publication in *PCW*. Additionally, readers comments upon the general or specific structure of this month's column would be most welcome. In particular, should the Numbers Count column be one page or two, and why? [*See the Fax Survey, page 607.*]

PCW Contributions Welcome

Mike Mudge welcomes readers' correspondence on any subject within the areas of number theory and computational mathematics, together with suggested subject areas and/or specific problems for future Numbers Count articles.