Pounding the beat

The pound in your pocket has been redefined! Currency conundrums, with **Mike Mudge**.

This investigation has been prompted by George Sassoon of Argyll, who recalled (at 14/10/95) an idea which he had years ago concerning the optimum design of currencies.

Most currencies have notes/coins valued at 1,2,5,10,20,50,.... but in Romania, or somewhere, George found a scale 1,3,10,30,100,... Now clearly, if the values are widely spaced, very few denominations of coins/notes are needed, but a lot of them are required for any given transaction... imagine a United Kingdom currency with only 1p, 10p, £1, £10, etc. in coins or notes. Conversely, if the values are closely spaced, a large number of denominations are needed, but in general, fewer coins/notes are required for a given transaction.

We ask, can an optimum currency be defined; and if so, is it practical?

A research student, Dave Foulser of Columbus, Ohio, observed that practical currencies approximate to geometrical progressions.**

****Definition**. A geometrical progression is a sequence of numbers starting with an initial (arbitrary) value and continuing by repeatedly multiplying this value by a constant number known as the common ratio. David suggests (private communication) that the true optimum currency, according to some as yet undefined criteria, might use a common ratio of

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e = 1/0! + 1/1! + 1/2! + 1/3!.....
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approximately 2.7182818 (n!, factorial n, being defined by 0! = 1 and n! = n x (n-1)! where n is a positive integer). However, Dave airily dismissses any practical difficulties arising from buying something costing, say, £9 - 99p using coins/notes valued at 1, 2.7183, 7.3891, 20.0855, 54,5982 pence and £1 - 48,4132, £4 - 03.429 etc. (Of course, the suggested figure of £9 - 99p relies only on the use of the 1p coin for its formation.)

Problem DF. Devise and implement an algorithm for expressing any number, N, in decimal in a number base b (general non-integer) to any prescribed degree of accuracy. Negative powers will in general be needed to the right of (i.e. on the least significant side of) the "point" to obtain the desired accuracy.

Problem GS. Devise and implement a program simulating societies with different currency systems paying each other randomly generated sums of money. Introduce some measure of the efficiency of a system of currency, which should involve not only the numbers of coins/notes needed for the transactions, but also take heed of the number of different denominations which the mint needs to produce, i.e. the complexity factor of the coinage. Using this measure, comment upon the efficiency of your current system of coinage and suggest ways in which this efficiency may be improved.

How many "Full Houses"? Readers may recall that in *PCW* August 1993, Mr. Ram Nair looked at the occurrence of two prime pairs within a single decade, which he referred to as "Full Houses". Now, John Humphries of Lechlade has returned to this problem and, after an analysis of the general permissible form of an I.PQ. (Intra-decadal Prime Quartet), has investigated their occurrence using Excel 5/Visual Basic on a V-Tech 486 SX25 machine. The difficulty John has encountered is that he discovers 37 such structures below 100000 whereas Mr. Nair claims only 35. Paul Rayner (PCW February 1995) has listed far more "Full Houses" than John, but the counting ambiguity remains.

Any investigations of problems DF & GS above, together with the resolution of the "Full Houses" query, may be sent to Mike Mudge, 22 Gors Fach, Pwll-Trap, St. Clears, Carmarthen, Dyfed SA33 4AQ, tel 01994 231121, to arrive by 1st June 1996. All material 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 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 results obtained.

Feedback from readers

A highly recommended publication: *An Introduction to the Smarandache Function* by Charles Ashbacher, Decisionmark, 200 2nd Avenue SE, Cedar Rapids, IA 52401, USA. ISBN 879585-49-9. 60 pages paperback, $7.95.

Some Smarandache Numerical Puzzles by M.R. Popov, Chandler College, Box 2834, Tempe, AZ 85280, USA. Stamped addressed envelope to Mike Mudge.

The Cake-Slicing Problem, *PCW* November 1995. Martin Sewell of Mill Hill, London, has carried out a details investigation resulting in a program in C upto n = 477, excludiung multiples of 6. Readers are urged to attempt to fill this gap in a fascinating problem first seen by the writer in *The Observer Weekend Review*, 1st December 1963, page 39, as Braintwister no. 156 by D. St. Barnard.

Paul Young of Beeston, Nottingham, has studed the solution of $x^3 + y^3 = z^2$ and published his results in *Mathematical Spectrum*, vol. 24, no. 3; he is generalising this work to expressing numbers as sums of fourth powers and, apart from the reference *The Queen of Mathematics* by A.H. Beiler, is short of ideas. Can any reader help?

Review of Numbers Count -148- Pseudo Skills in the sense of Florentin Smarandache

This article produced a very mixed response, ranging from the sharply critical "what a load of rubbish" to the mathematically detailed and enthusiastic. Much further material related to these topics can be found in *The Smarandache Journal*. Prizewinner, for "services to the cause of The Smarandache Function" both in the context of this Numbers Count and in more general areas — Charles Ashbacher, address above. More readers' responses to Smarandache ideas would be welcome and, if agreeable, submitted to *The Smarandache Journal*.

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.