EXAMPLES OF SMARANDACHE MAGIC SQUARES

by

M.R. Mudge

For $n \geq 2$, let A be a set of n^2 elements, and l a n-ary law defined on A.

As a generalization of the XVI-th - XVII-th centuries magic squares, we present the *Smarandache magic square of order n*, which is: 2 square array of rows of elements of A arranged so that the law l applied to each horizontal and vertical row and diagonal give the same result.

If A is an arithmetical progression and l the addition of n numbers, then many magic squares have been found. Look at Durer's 1514 engraving "Melancholia" 's one:

16	3	2	13
5	10	11	8
9	6	7	12
4	15	14	1

1. Can you find a such magic square of order at least 3 or 4, when A is a set of prime numbers and l the addition?
2. Same question when A is a set of square numbers, or cube numbers, or special numbers [for example: Fibonacci or Lucas numbers, triangular numbers, Smarandache quotients (i.e. q(m) is the smallest k such that mk is a factorial), etc.].

A similar definition for the *Smarandache magic cube of order n*, where the elements of A are arranged in the form of a cube of lenth n:

a. either each element inside of a unitary cube (that the initial cube is divided in)

b. either each element on a surface of a unitary cube

c. either each element on a vertex of a unitary cube.

3. Study similar questions for this case, which is much more complex.

An interesting law may be $l(a_1, a_2, \ldots, a_n) = a_1 + a_2 - a_3 + a_4 - a_5 + \ldots$

Now some examples of Smarandache Magic Squares: if A is a set of PRIME NUMBERS and l is the operation of addition, for orders at least 3 or 4.

Some examples, with the constant in brackets, elements drawn from the first hundred PRIME NUMBERS are :

83	89	41
29	71	113
101	53	59

(213)

101	491	251
431	281	131
311	71	461

(843)

71	461	311
521	281	41
251	101	491

(843)

113	149	257
317	173	29
89	197	233

(519)

97	907	557	397	197
367	167	67	877	677
997	647	337	137	37
107	157	967	617	307
587	277	227	127	937

(2155)

Now recall the year A.D. 1987 and consider the following .. all elements are primes congruent to seven modulo ten ....

967	1987	2017
2707	1657	607
1297	1327	2347

(4971)

1987	9907	11677	5237
4877	12037	9547	2347
10627	2707	4517	10957
11317	4157	3067	10267

(28808)

7	2707	5237	937	947
4157	1297	227	1087	3067
1307	1447	1987	4517	577
2347	3797	1657	1667	367
2017	587	727	1627	4877

(9835)

What about the years 1993, 1997, & 1999 ?

In Personal Computer World, May 1991, page 288, I examine:
A multiplication magic square such as:

18	1	12
4	6	9
3	36	2

with constant 216 obtained by multiplication of the elements in any row/column/principal diagonal.

A geometric magic square is obtained using elements which are a given base raised to the powers of the corresponding elements of a magic square .. it is clearly a multiplication magic square.
e.g. from

8	1	6
3	5	7
4	9	2

C=15

and base 2 obtain

256	2	64
8	32	128
16	512	4

where $M= 2^{15} = 32768$

Note that Henry Nelson of California has found an order three magic square consisting of *consecutive ten-digit prime numbers*. But "How did he do that" ???

A particular case:
TALISMAN MAGIC SQUARES are a relatively new concept, contain the integers from 1 to n^2 in such a way that the difference between any integer and its neighbours (either row-, column- or diagonal-wise) is greater than some given constant, D say.
e.g.

5	15	9	12
10	1	6	3
13	16	11	14
2	8	4	7

illustrates D=2.

References

1. Smarandache, Florentin, "Properties of Numbers", University of Craiova Archives, 1975;
   (see also Arizona State University, Special Collections, Tempe, AZ, USA)
2. Mudge, Mike, England , Letter to R. Muller, Arizona, August 8, 1995.

Current address:

22 Gors Fach, Pwll-Trap,
St. Clears, Carmarthen,
DYFED SA 33 4AQ
United Kingdom