

AN INLAID MAGIC SQUARE OF ORDER EIGHT & SEMI-BIMAGIC

19	24	21	18	42	45	48	43
59	40	10	61	32	50	5	3
35	58	37	16	2	29	56	27
11	13	64	34	53	8	26	51
14	33	15	60	25	55	4	54
38	63	36	9	7	28	49	30
62	12	57	39	52	1	31	6
22	17	20	23	47	44	41	46

Figure 1.

The Magic Sums for the whole 8th order square 260; upper left in beige 111; upper right in purple 87; the lower left in green 108; and, the lower right in blue 84. To be a magic square, any numbers may be used, as long as they are all different. To be a “regular” magic square, the consecutive numbers from 1 to m^2 are used, where “m” is called the order of the square and where the magic sum given by $S=m(1+m^2)/2$ is found in every row and column and in both diagonals.

In this example there is one regular magic square of order 8 and inlaid are four magic squares of order 3 .

A Bimagic Square means that the square is magic after you have squared all the numbers. If all the rows and columns sum the magic sum

$$= m.(m^2+ 1).(2m^2 + 1)/6$$

and the diagonals do not, then the square is deemed Semi-Bimagic.

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8	26	45	51	64	34	21	11
53	43	32	2	13	19	40	58
27	5	50	48	35	61	10	24
42	56	3	29	18	16	59	37
1	31	44	54	57	39	20	14
52	46	25	7	12	22	33	63
30	4	55	41	38	60	15	17
47	49	6	28	23	9	62	36

This 8th order regular magic square sums 260 in its rows, columns and both diagonals.

It has four inlaid magic squares that sum 130. Sometime, this is called the “Six-in-one magic square.”

An Inlaid Magic Square

64	676	2025	2601	4096	1156	441	121
2809	1849	1024	4	169	361	1600	3364
729	25	2500	2304	1225	3721	100	576
1764	3136	9	841	324	256	3481	1369
1	961	1936	2916	3249	1521	400	196
2704	2116	625	49	144	484	1089	3969
900	16	3025	1681	1444	3600	225	289
2209	2401	36	784	529	81	3844	1296

How rare are these magic squares? Well, there are estimated about 10^{69} atoms in the entire universe & there are about 5.797126×10^{120} ways of placing 81 numbers in 81 positions.

But when you square all the numbers, it sums 11180 in it's rows and columns.

Because the diagonals do not sum to the constant 11180, this is a *semi-bimagic* square.