On Magic Squares

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Mathematics

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Magic Squares

- A magic square of order n is an n x n array of the integers 1, 2, 3, … , n^2 such that the sum of each row, column, and main diagonal are the same.

8	1	6
3	5	7
4	9	2

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

17	24	1	8	15
23	5	7	14	16
4	6	13	20	22
10	12	19	21	3
11	18	25	2	9

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Magic Squares

- We can begin to generalize this by just requiring that the entries are distinct rather than strictly sequential.

12	9	24
27	15	3
6	21	18

17	89	71
113	59	5
47	29	101

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Magic Squares

- An open question: “Is there a magic square of order 3 whose entries are perfect squares?”

48^2	23^2	6^2	19^2
21^2	26^2	33^2	32^2
1^2	36^2	14^2	42^2
22^2	27^2	44^2	9^2

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Applications

- A stochastic matrix is used to describe the transitions of a Markov Chain.

| 1 | | 2 | | 3 | | 4 | | 5 |

0	1	0	0	0
1/2	0	1/2	0	0
0	1/2	0	1/2	0
0	0	1/2	0	1/2
0	0	0	1	0

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Applications

- In a doubly stochastic matrix, the sums of each row and column are equal to 1.

| 1 | | 2 | | 3 | | 4 | | 5 |

0	1/2	0	0	1/2
1/2	0	1/2	0	0
0	1/2	0	1/2	0
0	0	1/2	0	1/2
1/2	0	0	1/2	0

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