

Magic Cross

<http://www.geocities.com/CapeCanaveral/Lab/3469/magiccross.pdf>

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Definition

A *Magic Cross* $+_i^j$ is a cross made by integers of the sequence $1, 2, \dots, ji^2$ and formed by j Magic Square of order i .

In addition the sum of the rows and the columns of the cross is the same.

A simple method to make a Magic Cross

Degenerated Magic Cross $+_1^j$ is very important because it suggests the simplest way to make a Magic Cross. For example, starting by $+_1^5$ I'll show how to make $+_3^5$.

1		
2	3	4
5		

is a Magic Cross $+_1^5$ because 1,2,3,4,5 are degenerated Magic Square and the sum of the column $1+3+5$ is equal to the sum of the row $2+3+4$.

Now I'll made $+_3^5$ using $+_1^5$. From the sequence $1, 2, \dots, ji^2=45$ I take the first 9 numbers and make this magic square

8	1	6
3	5	7
4	9	2

I replace 1 from $+_1^5$ with the magic square made.

Then I take the next 9 numbers (10,...,18) and I make this magic square

17	10	15
12	14	16
13	18	11

I replace 2 from $+_1^5$ with the new magic square. And so on.

The result is this Magic Cross

			8	1	6			
			3	5	7			
			4	9	2			
17	10	15	26	19	24	35	28	33
12	14	16	21	23	25	30	32	34
13	18	11	22	27	20	31	36	29
			44	37	42			
			39	41	43			
			40	45	38			

Open Problems

Is this the only method to make a Magic Cross? Is there a formula to know the sum of the columns and the rows of the Magic Cross?