Melencolia I is a 1514 engraving by the German Renaissance master Albrecht Dürer

Magic Square

http://mathworld.wolfram.com/
DuerersMagicSquare.html
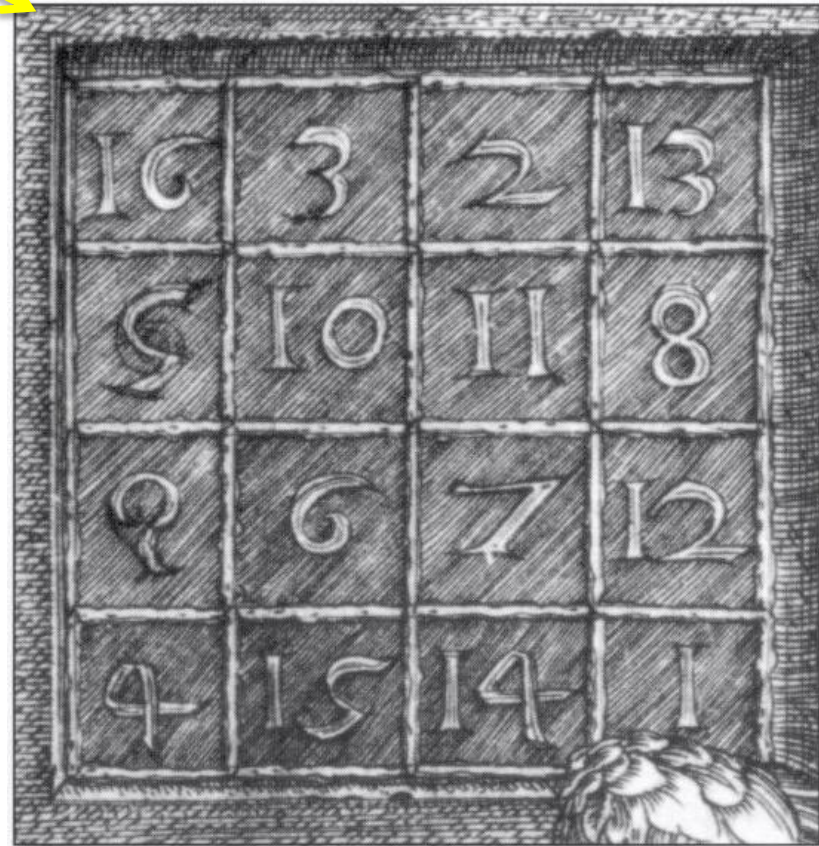
Dürer's magic square is a magic square with magic constant 34

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

As well as any row, column or diagonal adding to 34 so do any corner squares and the centre square

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

In fact any four symmetrically placed squares also add up to 34!

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

Definitions:

- Contains the integers 1,2,3, ….
- Magic constant is the sum of any diagonal, row or column and has the formula

$$n \, (\, n^2 + 1) \; / \; 2$$

    – Hence Dürer's magic square has magic constant 34

- Order is number of rows / columns

    – Hence Dürer's magic square has order 4

http://mathtimeline.weebly.com/magic-squares.html

History

- "Lo-Shu" – on the back of a divine turtle around 200BC in China

- > India (divinatory perfumes!)

- > Islamic world (astrologers!)

- > Europe (magic!)

See Pappas, T. *The Joy of Mathematics*
      Levy, J. *A Curious History of Mathematics*

No. of knots
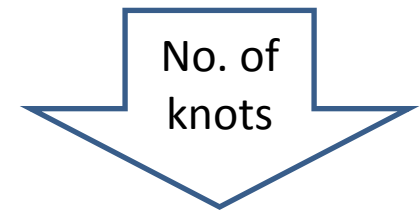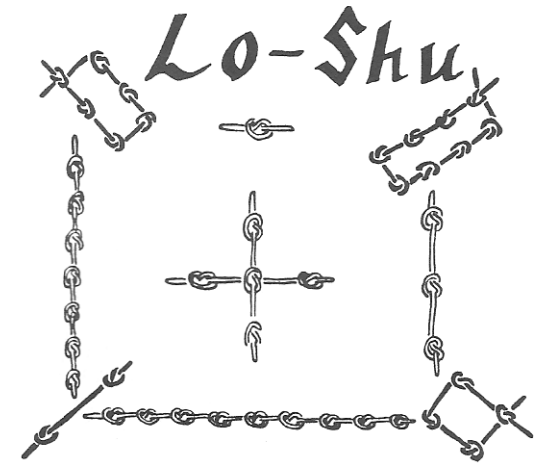
6	1	8
7	5	3
2	9	4

- The first magic squares of order 5 and 6 appear in an encyclopaedia from Baghdad *circa* 983 AD

- In Europe In about 1510 Heinrich Cornelius Agrippa wrote *De Occulta Philosophia*, in it he expounded on the magical virtues of seven magical squares of orders 3 to 9, each associated with one of the "astrological" planets.

Saturn=15

4	9	2
3	5	7
8	1	6

Jupiter=34

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

Mars=65

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

Sol=111

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

Venus=175

22	47	16	41	10	35	4
5	23	48	17	42	11	29
30	6	24	49	18	36	12
13	31	7	25	43	19	37
38	14	32	1	26	44	20
21	39	8	33	2	27	45
46	15	40	9	34	3	28

Mercury=260

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

Luna=369

37	78	29	70	21	62	13	54	5
6	38	79	30	71	22	63	14	46
47	7	39	80	31	72	23	55	15
16	48	8	40	81	32	64	24	56
57	17	49	9	41	73	33	65	25
26	58	18	50	1	42	74	34	66
67	27	59	10	51	2	43	75	35
36	68	19	60	11	52	3	44	76
77	28	69	20	61	12	53	4	45

Sagrada Família

- The Passion façade features a 4×4 magic square:

- The magic constant of the square is 33, the age of Jesus at the time of the Passion. Structurally, it is very similar to the Melencholia I magic square, but it has had the numbers in four of the cells reduced by 1.

- this is not a *normal* magic square as above, as two numbers (10 and 14) are duplicated and two (12 and 16) are absent
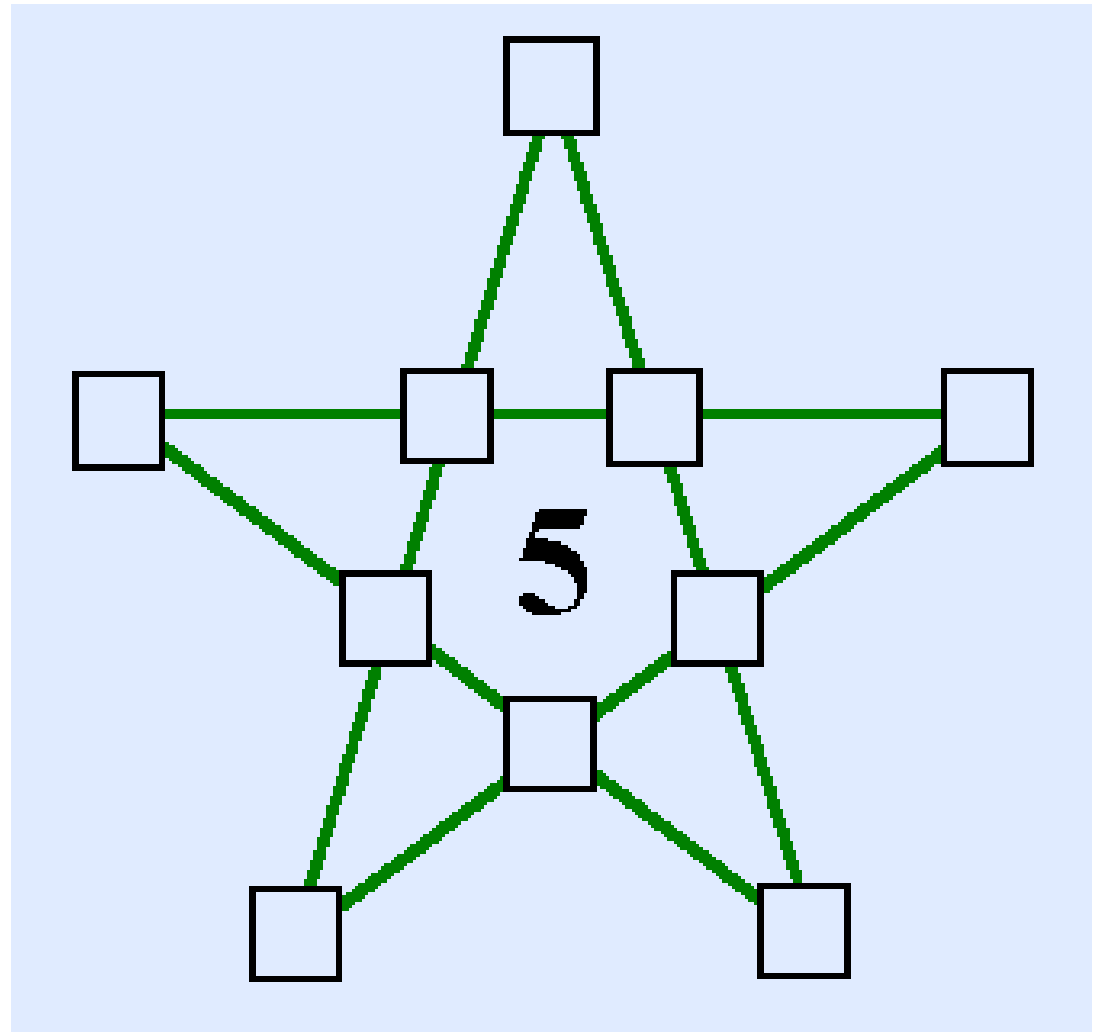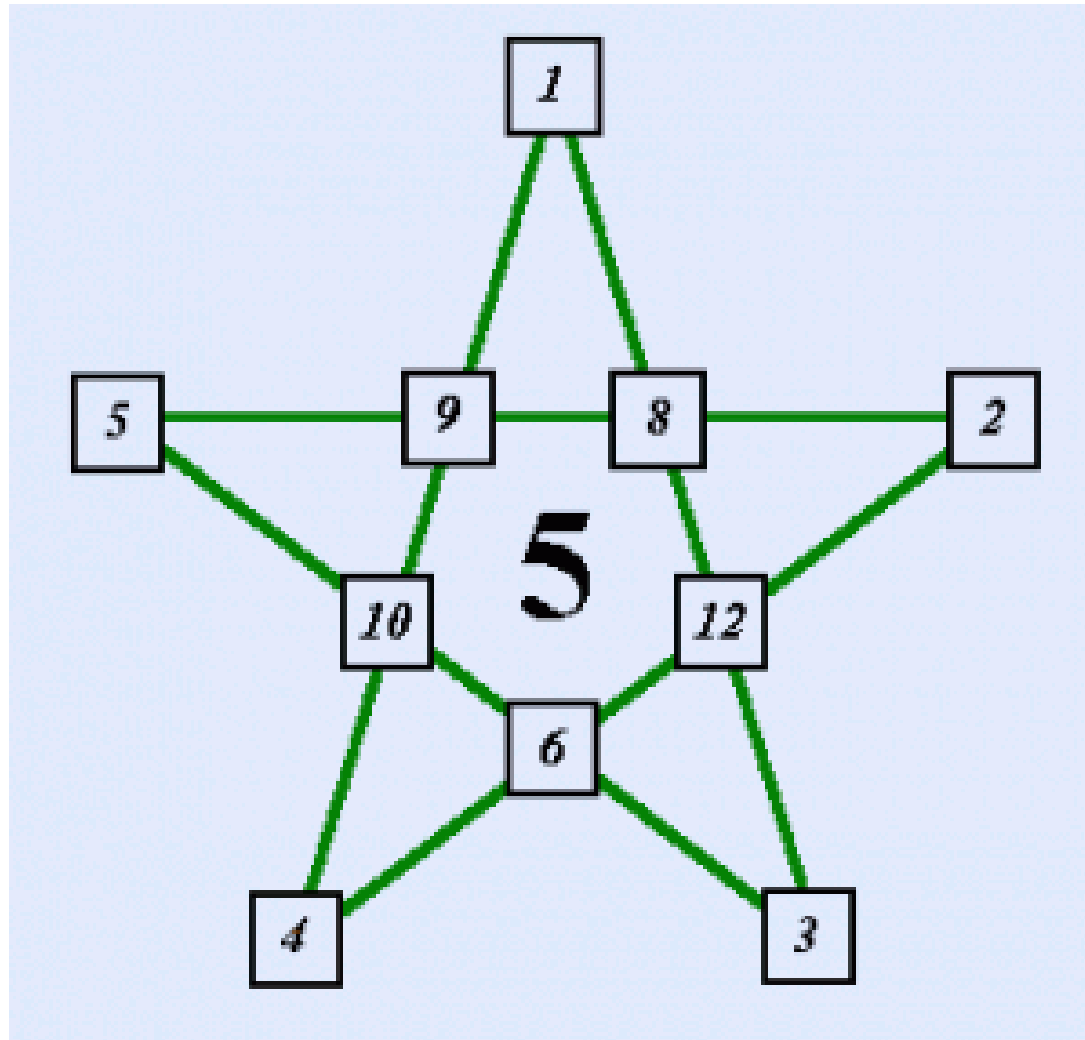

http://www.thefullwiki.org/Magic_square
http://mathtimeline.weebly.com/magic-squares.html

Magic Stars (Order 5 = 5 points)

- **Problem:** Using the numbers 1, 2 , 3, 4, 5, 6, 8, 9, 10 and 12 complete the magic star, so that the sum of all connected lines sum the same in all directions. They should add up to 24: Hint points are numbered 1-5.

Solution

Magic Stars

- The 5 pointed star or Pentagram has no 'perfect solutions for intersections numbered 1 to 10

- The 6 pointed star does however have solutions for the numbers 1 to 10 – this is an exercise for you to discover – there are 80 possible solutions. Each line should add up to 26.

How many are there?

In 1693, Bernard Frenicle de Bessy, an amateur French mathematician and magic square researcher posthumously published the 880 different fourth-order magic squares. The total possible magic squares that can be created from the numbers 1, 4, 9, 16, and 25 are 1, 0, 1, 880, and 275,305,224, respectively. The more numbers to make magic squares from, the more difficult they become to complete. The number of possible original magic squares of an arbitrary order is a problem yet to be solved.

Sudoku was inspired by a variation on magic squares devised by Leonhard Euler in the 18th century called Latin squares. In this variation, only numbers 1 through n are used, and each number only appears once in each row and column.
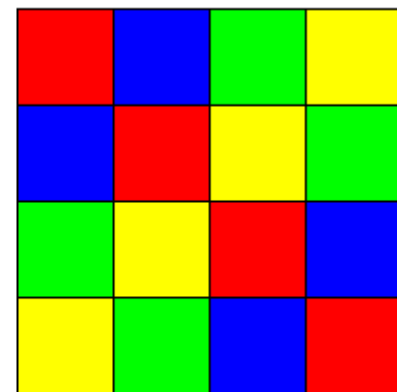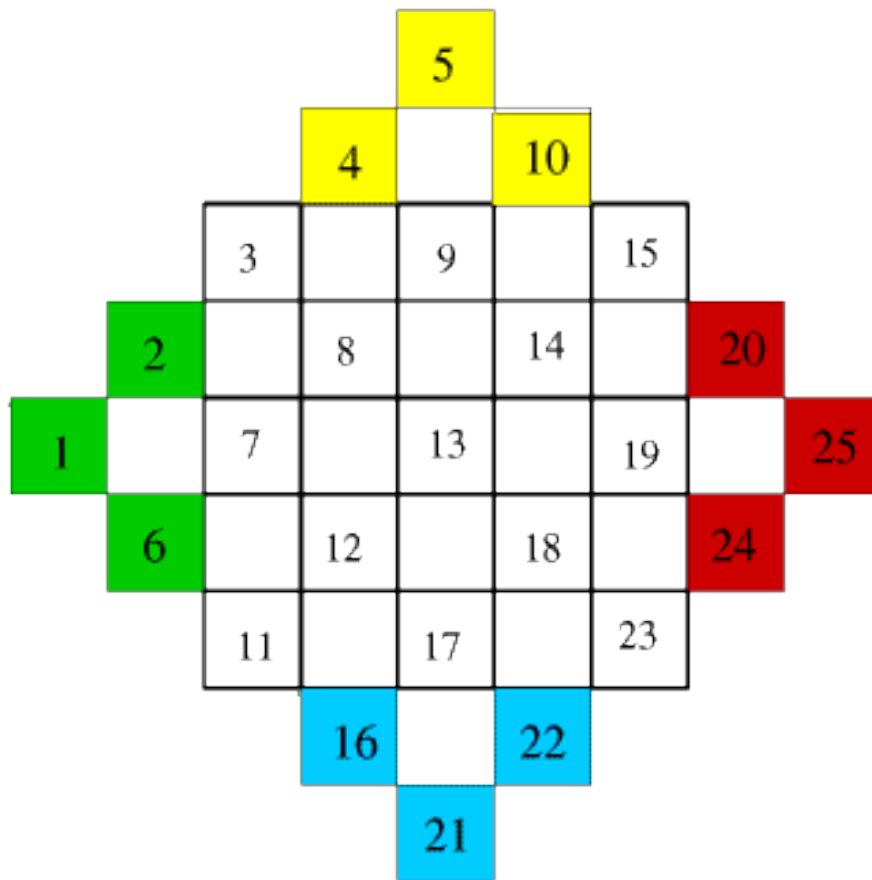
In the 1970's, Erno Rubrik, Was attempting to recreate the 15 puzzle in three dimensions when he came up with the Rubik's Cube.

Pyramid method making an odd magic square

http://nrich.maths.org/1337

- Euler's Magic Square Chess Knight problem