



8×8 and 4×4 Magic square

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Abstract

In this paper, there are two magic squares one is 4×4 birthday magic square which is already famous and another is 8×8 birthday magic square . But most important thing is that there is one method for both magic squares from that method we can create infinite magic square with the same date of birth.

Keywords:- Magic square

Introduction:- Magic squares are one of the most beautiful examples of the mathematical objects with several real-world applications. Benjamin Franklin 8×8 magic square whose sum of any row or column is nothing other than 260. Because Benjamin Franklin had not a common method to construct a magic square with any type of sum or when 1st row is filled with date of birth or any real number. In this paper, I have made a common method for 8×8 magic square from that method everybody can create his own birthday magic square by putting his date of birth in first row of magic square like 4×4 birthday magic square made by Srinivas Ramanujan . I made a 8×8 birthday magic square with the help of ramanujan birthday magic square.

1. Mukhtar 8×8 birthday magic square

12-03-1998 is my date of birth

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| 1 | 2 | 0 | 3 | 1 | 9 | 9 | 8 |
| 6 | 11 | 1 | 9 | 1 | 2 | -6 | 9 |
| -1 | 4 | 6 | -3 | 6 | 4 | 11 | 6 |
| 14 | 3 | 6 | 4 | 5 | -2 | 6 | -3 |
| 1 | 2 | -6 | 9 | 6 | 11 | 1 | 9 |
| 1 | 9 | 9 | 8 | 1 | 2 | 0 | 3 |
| 5 | -2 | 6 | -3 | 14 | 3 | 6 | 4 |
| 6 | 4 | 11 | 6 | -1 | 4 | 6 | -3 |

Fig .1

Properties of this magic square

- (I) The sum of all rows is 33.
- (II) The sum of all columns is 33.
- (III) The sum of both diagonal is also 33.
- (IV) And many other possibilities like Benjamin Franklin 8×8 magic square.

2. Common method for 8×8 birthday magic square

| | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|
| A | B | C | D | E | F | G | H |
| H+X-Y | G-X+Y | F-X-Y | E+X+Y | D+X-Y | C-X+Y | B-X-Y | A+X+Y |
| B-X | A+X | D+X | C-X | F-X | E+X | H+X | G-X |
| G+Y | H-Y | E+Y | F-Y | C+Y | D-Y | A+Y | B-Y |
| D+X-Y | C-X+Y | B-X-Y | A+X+Y | H+X-Y | G-X+Y | F-X-Y | E+X+Y |
| E | F | G | H | A | B | C | D |
| C+Y | D-Y | A+Y | B-Y | G+Y | H-Y | E+Y | F-Y |
| F-X | E+X | H+X | G-X | B-X | A+X | D+X | C-x |

Fig.2

From this method we can create infinite magic squares with one date of birth.

In fig.2 X and Y belong to any real number.

A is first digit of day

B is second digit of day

C is first digit of month

D is second digit of month

E is first digit of year

F is second digit of year

G is third digit of year

H is fourth digit of year

For example:- In figure 1st the top row is of date of birth

12-03-1998. In which day has two digit and month has also two digit but year has four digit.

Properties of this common 8×8 birthday magic square are mostly same as Benjamin Franklin 8×8 magic square

Sum of all rows ,columns , and both the diagonals are same and many others possibilities.

3. Infinite ways to construct Ramanujan birthday magic square

| | | | |
|-------|-------|-------|-------|
| A | B | C | D |
| D+X-Y | C-X+Y | B-X-Y | A+X+Y |
| B-X | A+X | D+X | C-X |
| C+Y | D-Y | A+Y | B-Y |

Fig.3

4. Ramanujan birthday magic square

| | | | |
|-----|-----|-----|-----|
| A | B | C | D |
| D+1 | C-1 | B-3 | A+3 |
| B-2 | A+2 | D+2 | C-2 |

| | | | |
|-----|-----|-----|-----|
| C+1 | D-1 | A+1 | B-1 |
|-----|-----|-----|-----|

Fig.4

In figure 3 and 4

A belongs to first two digits of date of birth

B belongs to next two digits of date of birth

C belongs to next two digits of date of birth

D belongs to next two digits of date of birth

In figure 3

X and Y belongs to real number

From figure 4 we can construct only 3-4 different magic square with same date of birth

But , From figure 3

We can construct infinite magic square with the same date of birth.

CONCLUSION

The discussion of two different magic squares both are named as birthday magic squares one is 8×8 magic square and another is 4×4 magic square. In 8×8 magic square there is one common method for creating different magic squares with any type of sum and also in 4×4 we can create different magic squares with any type of sum but the main is 8×8 which is new birthday magic square after ramanujan birthday magic square . Both the magic squares has different type of properties Moreover, construction method of both magic squares together with their properties are expressed. Physical application is still a new topic that needs to be explored more. There are many interesting ideas for research in this field such as in both magic squares how we can create infinite ways of constant sum.

REFERENCES

- 1. Ramanujan birthday magic square**
- 2. Benjamin Franklin 8×8 magic square**

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