Project01: Arrays

Magic Square

One interesting application of two-dimensional arrays is magic squares. A magic square is a square matrix in which the sum of every row, every column, and both diagonals is the same. Magic squares have been studied for many years, and there are some particularly famous magic squares. In this exercise you will write code to determine whether a square is magic.

File **Square.java** contains the shell for a class that represents a square matrix. It contains headers for:
- a constructor that gives the size of the square
- method to read values into the square,
- method to print the square,
- method to find the sum of a given row,
- method to find the sum of a given column,
- method to find the sum of the main (or other) diagonal,
- Method to determine whether the square is magic.

The read method is given for you; you will need to write the others. Note that the read method takes a Scanner object as a parameter.
The method print is given as well.

File **MagicSquareTest.java** contains the shell for a program that reads input for squares the user and tells whether each is a magic square. Following the comments, fill in the remaining code. Note that the main method reads the size of a square, then after constructing the square of that size, it calls the readSquare method to read the square in.

1. implement all the missing function in **"MagicSquare.java" file**
2. Complete the class with a main program in **"MagicSquareTest.java"**
3. Submit the two updated java files (1) and (2)

Here is a sample run:

```
Enter the size of the square: (To stop type -1 ): 3
Enter Element[1][1]:8
Enter Element[1][2]:1
Enter Element[1][3]:6
Enter Element[2][1]:3
Enter Element[2][2]:5
Enter Element[2][3]:7
Enter Element[3][1]:4
Enter Element[3][2]:9
Enter Element[3][3]:2

******** Square 1 ********
8  1  6
3  5  7
4  9  2
The Sum of row#1 = 15
The Sum of row#2 = 15
The Sum of row#3 = 15
The Sum of column#1 = 15
The Sum of column#2 = 15
The Sum of column#3 = 15
The Sum of the main diagonal = 15
the square is magic
```

```
Enter the size of the square: (To stop type -1 ): 2
Enter Element[1][1]:1
Enter Element[1][2]:2
Enter Element[2][1]:3
Enter Element[2][2]:-1

******** Square 2 ********
1   2
3   -1
The Sum of row#1 = 3
The Sum of row#2 = 2
The Sum of column#1 = 4
The Sum of column#2 = 1
The Sum of the main diagonal = 0
the square is not magic

Enter the size of the square: (To stop type -1 ): 4
Enter Element[1][1]:48
Enter Element[1][2]:9
Enter Element[1][3]:6
Enter Element[1][4]:39
Enter Element[2][1]:27
Enter Element[2][2]:18
Enter Element[2][3]:21
Enter Element[2][4]:36
Enter Element[3][1]:15
Enter Element[3][2]:30
Enter Element[3][3]:33
Enter Element[3][4]:24
Enter Element[4][1]:12
Enter Element[4][2]:45
Enter Element[4][3]:42
Enter Element[4][4]:3

******** Square 3 ********
48   9   6   39
27   18   21   36
15   30   33   24
12   45   42   3
The Sum of row#1 = 102
The Sum of row#2 = 102
The Sum of row#3 = 102
The Sum of row#4 = 102
The Sum of column#1 = 102
The Sum of column#2 = 102
The Sum of column#3 = 102
The Sum of column#4 = 102
The Sum of the main diagonal = 102
the square is magic


Enter the size of the square: (To stop type -1 ): -1
End of the program. bye!!2
```