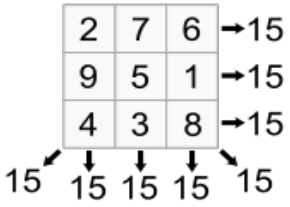
CS 218
Homework, MIPS Asst. #3

Purpose:	Become familiar with the MIPS Instruction Set, and the MIPS function calling convention, and indexing for multiple dimension arrays.
Due:	Wednesday (7/05)
Points:	75

Assignment:
Write a simple assembly language function to check if a two-dimensional array is a *magic square*[1]. The provided main calls the following functions as follows:

- Write a void function, ***chkMagicSqr(arr, order)***, that will check an (***n*** by ***n***) two-dimensional array to see if it is a magic square. In recreational mathematics, a magic square of order ***n*** is an arrangement of n^2 numbers, usually integers, in a square stored as a two-dimensional array, such that the ***n*** numbers in all rows, all columns, and both diagonals sum to the same value. A normal magic square contains the integers from 1 to n^2.

  For example:



  This function must call the ***prtMsg()*** function to display the sums (each row, each column, and each diagonal).

- Write a void function, ***prtMsg(str, num, sum)***, to display the row, column, or diagonal message, the row/col/diagonal number, and sum. Refer to the example execution for output formating.

- Write a void function, ***prtSquare(arr, order)***, to display an (***n*** by ***n***) two-dimensional matrix. The numbers should be printed in a two-dimensional format (see example output). All numbers must be right justified (i.e., lined up on right side).

Array Implementation:
At the machine level, multi-dimension arrays are implemented as a large single dimension array. The formula for calculating two-dimensional array indexing is:

```
addr[row,col] = baseAddress + (row * colDimension + col) * elementSize
```

You must use the formula to access matrix elements. **No score** will be provided for submissions that do not use this formula. The **`colDimension`** is the number of columns the array was originally created with. The **`elementSize`** would be 4 for word, 2 for halfwords and 1 for bytes.

1 For more information, refer to: https://en.wikipedia.org/wiki/Magic_square

Submission:
When complete, submit:

- A copy of the **source file** via the class web page by class time.
  Assignments received after the start time of class will not be accepted.

Example Output:
The following is the example output for the first data set:

```
MIPS Assignment #3
Program to check a Magic Square.

-------------------------------------------
Possible Magic Square #1

    2     7     6
    9     5     1
    4     3     8

   Row  #0   Sum: 15
   Row  #1   Sum: 15
   Row  #2   Sum: 15
   Col  #0   Sum: 15
   Col  #1   Sum: 15
   Col  #2   Sum: 15
   Diag #1   Sum: 15
   Diag #2   Sum: 15

IS a Magic Square.

-------------------------------------------

    [ ... output truncated for space ... ]

-------------------------------------------
Possible Magic Square #3

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

   Row  #0   Sum: 34
   Row  #1   Sum: 34
   Row  #2   Sum: 33
   Row  #3   Sum: 34
   Col  #0   Sum: 34
   Col  #1   Sum: 33
   Col  #2   Sum: 34
   Col  #3   Sum: 34
   Diag #1   Sum: 34
   Diag #2   Sum: 33

NOT a Magic Square.

    [ ... output truncated for space ... ]
```

Note, not all data sets not shown.