

## Warm Up Exercises Week 7

1. Write a program that declares a two dimensional array of integers with 4 rows and 4 columns. Populate this array from the keyboard using nested for loops. Once populated find the sum of the elements on the main (or principal) diagonal (i.e. the on where  $i=j$ )
2. Write code (i.e. a function) to determine whether a matrix  $a[i][j]$  is symmetric. A matrix is symmetric iff.  $a[i][j]=a[j][i] \forall i,j$ . (the upside down A  $\forall$  is short hand for “for all”).
3. Write code to compute the transpose of a matrix A, denoted as  $A^T$ , where for the matrix  $a[i][j]$ , its transpose b is given be  $a[j][i]$ .
4. Write a program that declares a multidimensional array  $a[i][2]$ , which stores the values of i and of its square, so that we have:  
 $a[0][0] = 1, a[0][1] = 1$   
 $a[1][0] = 2, a[1][1] = 4$   
 $a[2][0] = 3, a[2][1] = 9$   
 $a[3][0] = 4, a[3][1] = 16$

and so on up to  $a[n][2]$ . Print these values out

5. A magic square is an arrangement of numbers with n rows and n columns. The sums of the values in each row, each column and main diagonal are the same. For example the following is a magic square  

16	9	2	7	(sum of row one: 34)	sum of column one is 34
6	3	12	13	(sum of row two: 34)	sum of column two is 34
11	14	5	5	etc	
1	8	15	10		

write code to determine if a square matrix is a magic square.

6. Write a class called shape with attributes (data) length, width and height  
Write methods that return the area (if it is a two dimensional figure and perimeter (or circumference if your shape is a circle).  
If your figure is three dimensional (stick to cubes or cuboids) write a function that determines the volume. Overload your constructor such that you can assign values to one of the attributes, two of the attributes, three of the attributes or none of the attributes. The class must have mutator functions that change the values of the width, length and height respectively and accessor functions that return these data items.
7. Write a program that declares a pointer to an integer. Make the pointer hold the address of an array. Using pointer arithmetic print the contents of the array to the screen. (It might be best to use a while loop to achieve this)
8. Explain the meaning of the following code:

```

#include <iostream>

using namespace std;

int main ()
{
    int  var = 20;    // actual variable declaration.
    int  *ip;         // pointer variable

    ip = &var;        // store address of var in pointer variable

    cout << "Value of var variable: ";
    cout << var << endl;

    // print the address stored in ip pointer variable
    cout << "Address stored in ip variable: ";
    cout << ip << endl;

    // access the value at the address available in pointer
    cout << "Value of *ip variable: ";
    cout << *ip << endl;

    return 0;
}

```

And

```

#include <iostream>

using namespace std;

int main ()

```

```
{  
    int var1;  
    char var2[10];  
  
    cout << "Something doing";  
    cout << &var1 << endl;  
  
    cout << "Something doing";  
    cout << &var2 << endl;  
  
    return 0;  
}
```