2-D Array Problems

1. Write a method in C# which accepts a two-dimensional integer array as an argument along with two integer arguments which give the number of rows and columns in the array. Your method should return the average of the elements in the array. The following statement is a sample calling statement for your method.

```csharp
int a[,] = {{9, 4, 3, 2}, {4, 23, 32, 45}, {6, 31, 14, 26}};
Console.WriteLine(AddMethod(a, 3, 4));
```

2. Write a program which creates a two-dimensional array (initialized below) and treats the two values in one row as the coordinates of points in an X-Y plane. Find the two points which are the furthest apart.

```csharp
double[,] p = {{0, 0}, {2.2, -2.3}, {3.4, -8.5}, {-9.5, -2.1},
               {10.3, -2.1}, {7.5, 4.4}, {2.1, 4.4}}
```

Use the distance formula to find the two points which are the farthest apart.

\[ d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2} \]

3. Consider the following definition of a two-dimensional integer array which represents test scores for three exams and ten students:

```csharp
int[,] grades = {{90, 90, 80},
                 {80, 80, 70},
                 {50, 60, 70},
                 {40, 80, 80},
                 {60, 60, 70},
                 {70, 80, 70},
                 {90, 60, 50},
                 {30, 80, 60},
                 {60, 60, 50}};
```

Write a program to calculate and print the average value for each test and the average value for each student on each test.

4. Create a two dimensional array named `diceSums` which is 7 x 7. Pass this array to a method called `AddRowCol` which will fill in the array with the sum of the row and column indices. In the main program print the sums for row 1-6 and columns 1-6 in a 6 x 6 grid.

5. Write a method which accepts a square array of ints and returns the sum of each diagonal as reference parameters. For example, if I call you method using

```csharp
FindDiagonalSums(squareArray, ref firstSum, ref int secondSum);
```

the sum of the diagonals would be returned in the reference parameters.
6. Write a program which creates a 2 dimensional array that is 50 x 50. Fill the array with random ints which range from 1 to 6. Write a program to count the number of 1's, 2's, … 6's in the array and print the result.

7. Create a 2-d array that has the following data:
   ```csharp
double [,] Pt = { { 0.0, 0.0}, // Point 0
                   {10.2, 2.3}, // point 1
                   {9.7, 4.5}, // point 2
                   {-4.5, 3.2}, // point 3
                   {-4.9, -5.7}, // point 4
                   {-9.0, 2.9}, // point 5
                   {6.3, -9.1}, // point 6
                   {6.5, -1.8}, // point 7
                   {-1.0, -4.1}, // point 8
                   {-6.2, -2.6} // point 9
                 };
```
   Take this data to represent a set of points on a two-dimensional plane. Each set of three points can form a triangle. Find the triangles with the maximum and the minimum area for this set of points. You can find the area of a triangle by using the following equations:
   
   $s = (d1 + d2 + d3) / 2$;

   $area = \sqrt{s(s-d1)(s-d2)(s-d3)}$

   $dx = \sqrt{(x1 - x2)^2 + (y1 - y2)^2}$

   Your program should not only print the maximum and minimum areas, it should also print the point numbers that form the maximum and minimum triangles. Point numbers are given in the comments above.

8. Write a program which creates a 30 random numbers which range from 0 to 10 and have an approximate Gaussian distribution. Save the data to an array. Create a bar graph of the array data. (The random number generator in C# produces a flat distribution where each number is equally likely. To get an approximate Gauss distribution find the average value of 12 random numbers with a flat distribution.)