

Lesson 15 - Collections II

Recall,

C# has many more complex data types built-in that help us to store and manipulate data. One such example is the `Array` type. An `Array` stores collections of data of the **same type**. An example, let us suppose we want to store 5 number, without using arrays, you would something like this,

Multidimensional Arrays

`Arrays` can have multiple dimensions. a 2 dimensional array is declared as,

```
int[,] myArray = new int[3,4];
```

The resultant array can be represented in the form of a table as follows,

	Column 1	Column 2	Column 3	Column 4
Row 1	[0] [0]	[0] [1]	[0] [2]	[0] [3]
Row 2	[1] [0]	[1] [1]	[1] [2]	[1] [3]
Row 3	[2] [0]	[2] [1]	[2] [2]	[2] [3]

Think of a multidimensional array as a **matrix**.

```
int[,] multidimensionalArray = new int[3,3];

int[,] multidimensionalArray =
{
    { 1, 2, 3 },
    { 4, 5, 6 },
    { 7, 8, 9 }
}
```

Jagged Arrays

These are arrays of arrays. So an array not made of integers, or boolean values or strings, but an array made up of arrays.

```
int[][] jaggedArray = new int[3][];  
  
int[][] jaggedArray =  
{  
    new int[] { 1, 2, 3, 7},  
    new int[] { 4, 5 },  
    new int[] { 7, 8 , 9 }  
};
```

Think of these like separate rows that can have different number of items.

1	2	3	7
---	---	---	---

4	5
---	---

7	8	9
---	---	---

Nested Loops

Nested loops means loops inside a loop. They can be used to index multidimensional and jagged arrays.

Example: Multidimensional Arrays

```
int numStudents = 2;  
int numCourses = 3;  
  
int[,] classGrades = new int[numStudents, numCourses];  
  
Console.WriteLine("\nTaking Input\n");  
  
for (int i = 0; i < numStudents; i++)  
{  
    Console.WriteLine("\nGrades for student " + (i+1));  
  
    for (int j = 0; j < numCourses; j++)  
    {  
        Console.Write($"Grade in course {j+1}: ");  
        classGrades[i,j] = Convert.ToInt32(Console.ReadLine());  
    }  
}
```

Example: Jagged Arrays

```
int numStudents = 2;
int numCourses = 3;

int[][] classGrades = new int[numStudents][];

Console.WriteLine("\nTaking Input\n");

for (int i = 0; i < numStudents; i++)
{
    Console.WriteLine("\nGrades for student " + (i + 1));
    classGrades[i] = new int[numCourses];

    for (int j = 0; j < numCourses; j++)
    {
        Console.Write($"Grade in course {j + 1}: ");
        classGrades[i][j] = Convert.ToInt32(Console.ReadLine());
    }
}
```