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# 1D and 2D arrays

arrays

# Цель обучения (Learning objectives):

write program code using 1D and 2D arrays for different data types

# Критерии успеха (Successful criteria):

- Knows and understands the purpose of the data type array
- Knows the concepts of array name, array dimension, element index, array elements, array element types
- Can declare the data type of an array in a variable section
- Can perform input / output of array elements
- Can use array data types when solving problems

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# Questions for discussion

- What are arrays?
- How to determine the name of the array, the dimension of the array, the index of the element, the elements of the array, the types of elements of the array.
- How to declare an array data type in a variable section

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An **array** is similar to a table of objects or primitive types, keyed by index.

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Diana | Abai | Malika | Zhanna | Maya |

1D Array: Students

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 31 | 30 | 34 | 33 | 37 |

1D Array: Marks

An array is a named set of the same type of data that is stored in memory consecutively one after the other.

Access to the elements of the array is carried out by the index (number) of the element.

An array can contain elements of any data type (integer, real, character, string).

The number of elements in an array is called the size of the array.

# Declaration of an array in the variable section

<type of array> [] <name of array>;

Examples:

int[] a1;

char[] ch1;

double[] db1;

Indexing arrays starts from zero, so the index of the first element of the array is 0.

The array element is accessed via square brackets [].

For example: A [0] = 5

# Initializing array elements

**1 variant**

int [] к; //к — array

k= new int [3]; //Define an array of 3 integers

к[0]=-5; к[1]=4; к[2]=55; // Set array elements

**2 variant**

int[] a = {0, 2, 4, 6, 8};

**3 variant**

int[] a = new int [] {0, 2, 4, 6, 8};

**4 variant**

int[] a=new int[5];

a[0] = 0; a[1] = 2; a[2] = 4; a[3] = 6; a[4] = 8;

**Task:** One-dimensional array is given. You need to calculate the sum of the elements of this array.

```
public partial class Form1 : Form
   { int  [] mas  =  new  int [] { 1, 3, 5, 7, 9, 4, 8, 2, 6, 10 }; //Creating an array with values
private void button1_Click(object sender, EventArgs e)
      {
         listBox1.Items.Clear();   // clear
         for (int i = 0; i < 10; i++)
         {
            listBox1.Items.Add(mas[i]);
         }
      }
      private void button2_Click_1(object sender, EventArgs e)
      {
         listBox1.Items.Clear();
         int s=0;
         for (int i = 0; i < 10; i++)
         {
            s=s+mas[i];
         }
         listBox1.Items.Add(s);
      }
```

**Task:** One-dimensional array is given. You need to calculate the sum of the elements of this array. The value of the elements is set randomly.

```
private void button1_Click(object sender, EventArgs e)
    {
        Random rd = new Random();
        int[] mass = new int[5];
        int  i, s = 0;
        for (i = 0; i<mass.Length; i++)
        {
            mass[i] = rd.Next(5);
            s = s + mass[i];
            listBox1.Items.Add(mass[i]);
        }
        label1.Text = Convert.toString(s);
    }
```

# Exercise #1

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Diana | Abai | Malika | Zhanna | Maya |

1D Array: Students

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 31 | 30 | 34 | 33 | 37 |

1D Array: Marks

**<u>Call me value of:</u>**

Marks[3]

Students[0]

Students[1]+'
'+Marks[1]

# Exercise #2

Explain every part of next line:

```
{ int  [] mas  =  new  int [] { 1, 3, 5, 7, 9, 4, 8, 2, 6, 10 };
```

1 2 3

# Exercise #2

**1– data type of array elements**

**2– name of array**

**3 – array element values**

# Exercise #3

Describe list (Pen, Pencil, Copybook, Eraser) in C# using type array.

# Exercise #4

Fill ten array elements random numbers [-20; 20]

# Exercise #5

Output ten array elements in line in a space.

Write fragment of code.

# QQQ

What is the output of the following code:

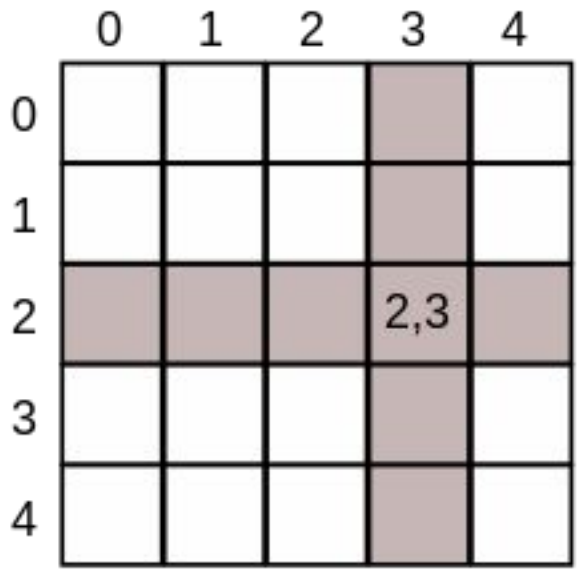
```
array primes = (2,3,5,7,11,13,17,19,23)
count = 8
While count >= 0
write(primes[count] , “,   “ )
count = count - 1
end while
```

# One dimensional array on Wikibooks

https://en.wikibooks.org/wiki/A-level_Computing/AQA/Paper_1/Fundamentals_of_data_structures/Arrays

# Two dimensional array (Matrix)

Most major programming languages allow you to use **two-dimensional arrays**. They work in much the same way as a one-dimensional array but allow you to specify **a column index** and **a row index**.




A **two-dimensional array** is used to create a table of data in rows and columns with the same data type.

# Declaration

```
int [,] mas = new int[5,5];

int[,] mas = new int[3, 3] { { 4, 7, 3 }, { 3, 6, 9 },
{ 0, 1, 4 } };

int[,] mas = { { 4, 7, 3 }, { 3, 6, 9 }, { 0, 1, 4 } };
```

# Assign Values to Two Dimension

a[0,0] = 76;
a[0,1] = ?
a[1,0]= ?
a[1,1] = ?
a[2,0] = ?
a[2,2] = ?

| | |
|---|---|
| 76 | 55 |
| 44 | 88 |
| 95 | 37 |

# Two dimensional arrays on wikibooks

- https://en.wikibooks.org/wiki/A-level_Computing/AQA/Problem_Solving,_Programming,_Data_Representation_and_Practical_Exercise/Fundamentals_of_Programming/Two-Dimensional_Arrays

# Reflection

- What knows?
- What remained unclear
- What is necessary to work on