Assignment 2

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02 Arrays and Strings

Test your Knowledge

Test your Knowledge

1. **When to use String vs. StringBuilder in C# ?**

A: String type is used to store immutable string values. StringBuilder is a mutable class, meaning that it can be modified without creating new objects. Thus StringBuilder has better performance for processing large strings or strings that grow dynamically. But String value is not expected to change frequently. Correspondingly, for small number of string concatenations or manipulations, we use String; for large one, we use StringBuilder.

2. **What is the base class for all arrays in C#?**

A: "System.Array". It is an abstract class that provides various properties and methods for working with arrays. This class is derived from the "System.Object" class, which is the ultimate base class for all types in the .NET framework.

3. **How do you sort an array in C#?**

A: We can use the method of "System.Array" named "Sort", which can help to sort the elements in a one-dimensional array.

E.g. int[] numbers = { 5, 3, 8, 1, 9 }; // Define an array
Array.Sort(numbers); // Sort the array

4. **What property of an array object can be used to get the total number of elements in an array?**

A: We can use the method of "System.Array" named "Length", which can help to gets the total number of elements in all dimensions of the array.

E.g. int[] numbers = { 5, 3, 8, 1, 9 }; // Define an array
Console.WriteLine(numbers .Length); // Output: 5

5. **Can you store multiple data types in System.Array?**

A: Yes we can. Since "System.Object" is the base class for all types in .NET, an array of object can hold elements of different data types.

E.g1. Explicit using Array (Using SetValue)

```
Array mixedArray = Array.CreateInstance(typeof(object), 3);
mixedArray.SetValue(7, 0);
mixedArray.SetValue("Mark!", 1);
mixedArray.SetValue(0.45, 2);
```

E.g2. Implicit using Array(Using object)

```
object[] mixedArray = {7, "Mark!", 0.45};
```

6. What's the difference between the System.Array.CopyTo() and System.Array.Clone()?

A: There are three main difference: First, "CopyTo()" requires a pre-allocated target array and allows copying elements to a specific index, while "Clone()" creates a new array with the same length as the original. Second, "CopyTo()" allows partial copying or merging of arrays, while "Clone()" always creates a full copy of the original array. Third, The result of "Clone()" needs to be cast to the appropriate array type, while "CopyTo()" directly copies elements to the target array.

Practice Arrays

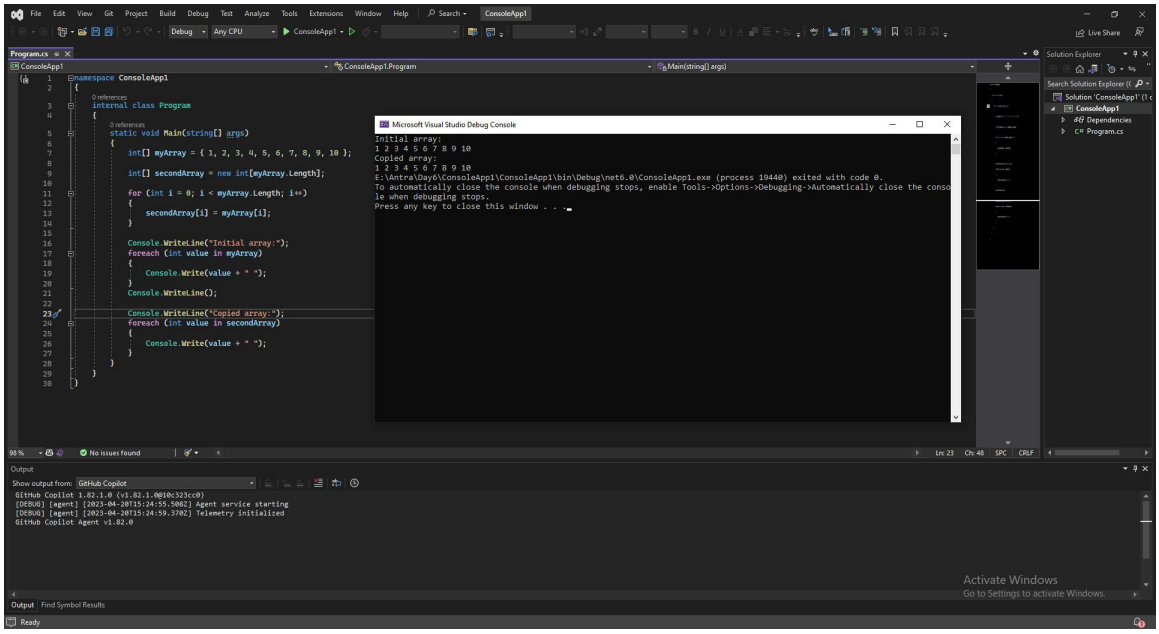
1. Copying an Array

Write code to create a copy of an array. First, start by creating an initial array. (You can use whatever type of data you want.) Let's start with 10 items. Declare an array variable and assign it a new array with 10 items in it. Use the things we've discussed to put some values in the array.

Now create a second array variable. Give it a new array with the same length as the first. Instead of using a number for this length, use the Lengthproperty to get the size of the original array.

Use a loop to read values from the original array and place them in the new array. Also print out the contents of both arrays, to be sure everything copied correctly.

A: My answer can be seen as below:



2. Write a simple program that lets the user manage a list of elements. It can be a grocery list, "to do" list, etc. Refer to Looping Based on a Logical Expression if necessary to see how to implement an infinite loop. Each time through the loop, ask the user to perform an operation, and then show the current contents of their list. The operations available should be Add, Remove, and Clear. The syntax should be as follows:

+ some item

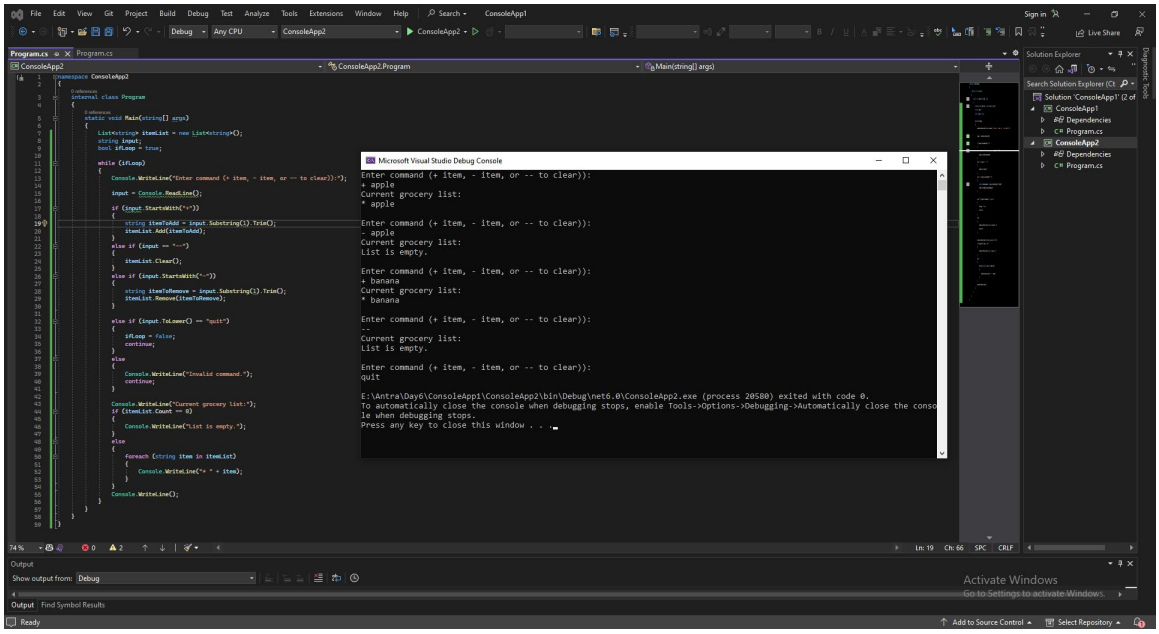
- some item

--

Your program should read in the user's input and determine if it begins with a "+" or "-" or if it is simply "—" . In the first two cases, your program should add or remove the string given ("some item" in the example). If the user enters just "—" then the program should clear the current list. Your program can start each iteration through its loop with the following instruction:

Console.WriteLine("Enter command (+ item, - item, or -- to clear)):");

A: My answer can be seen as below:



3. Write a method that calculates all prime numbers in given range and returns them as array of integers

static int[] FindPrimesInRange(startNum, endNum)

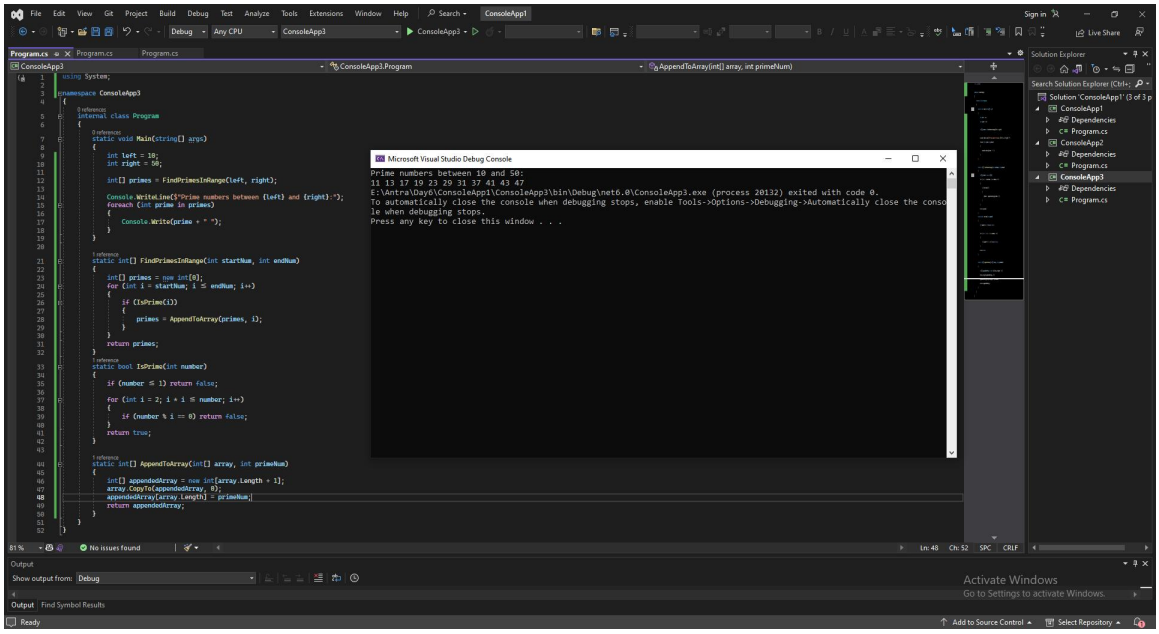
{

}

A: My answer can be seen as below:

```
static int[] FindPrimesInRange(int startNum, int endNum)
{
    int[] primes = new int[0];
    for (int i = startNum; i ≤ endNum; i++)
    {
        if (IsPrime(i))
        {
            primes = AppendToArray(primes, i);
        }
    }
    return primes;
}
```

This function also use two extended subfunctions named: “IsPrime(int num)”,
and “AppendToArray(int[] array, int primeNum)”. The full version of code can be seen below:



4. Write a program to read an array of n integers (space separated on a single line) and an integer k, rotate the array right k times and sum the obtained arrays after each rotation as shown below.

- **After r rotations the element at position I goes to position (I + r) % n.**
- **The sum[] array can be calculated by two nested loops: for r = 1 ... k; for I = 0 ... n-1.**

Input Output Comments

3 2 4 -1 3 2 5 6 rotated1[] = -1 3 2 4

2 rotated2[] = 4 -1 3 2

sum[] = 3 2 5 6

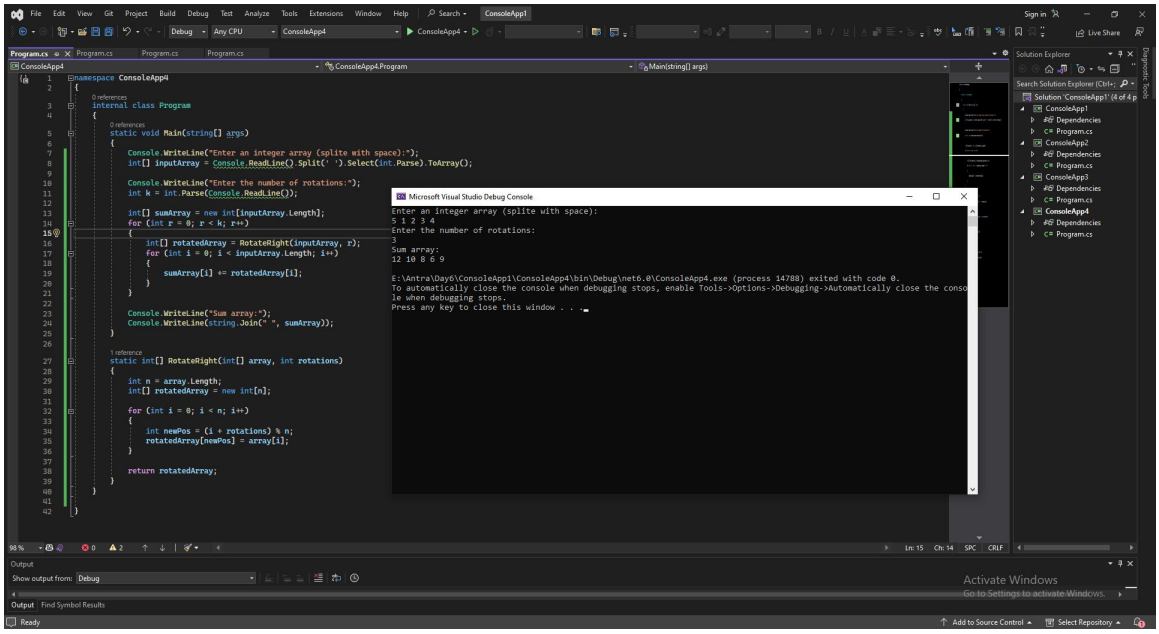
1 2 3 4 5 12 10 8 6 9 rotated1[] = 5 1 2 3 4

3 rotated2[] = 4 5 1 2 3

rotated3[] = 3 4 5 1 2

sum[] = 12 10 8 6 9

A: My answer can be seen as below:



5. Write a program that finds the longest sequence of equal elements in an array of integers. If several longest sequences exist, print the leftmost one.

Input Output

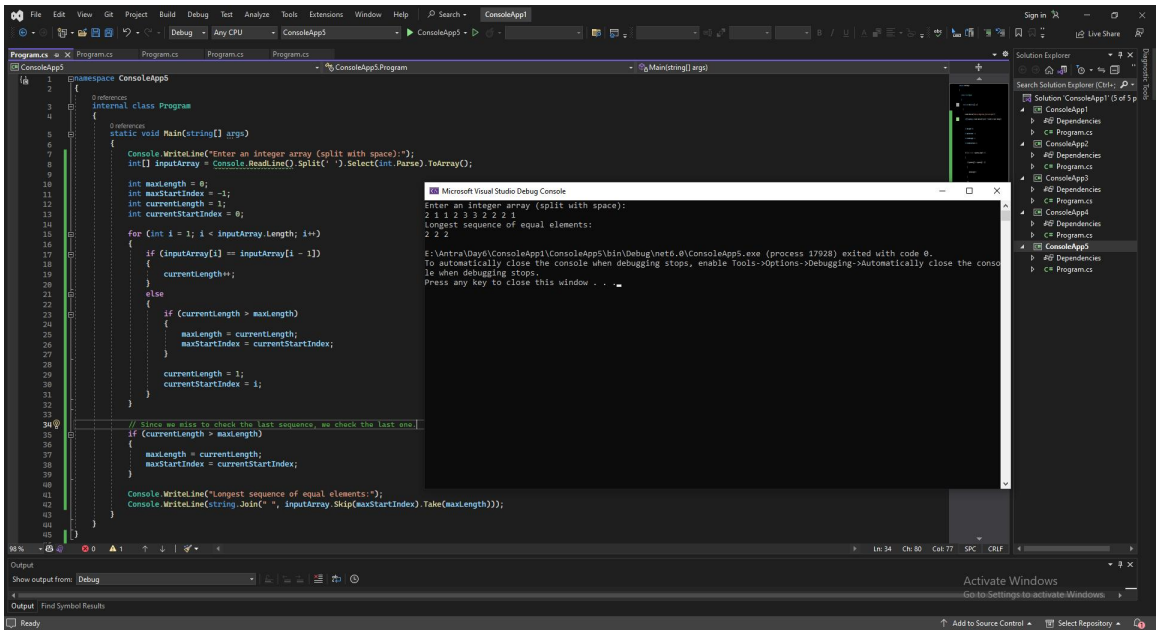
2 1 1 2 3 3 2 2 2 1 2 2 2

1 1 1 2 3 1 3 3 1 1 1

4 4 4 4 4 4 4 4

0 1 1 5 2 2 6 3 3 1 1

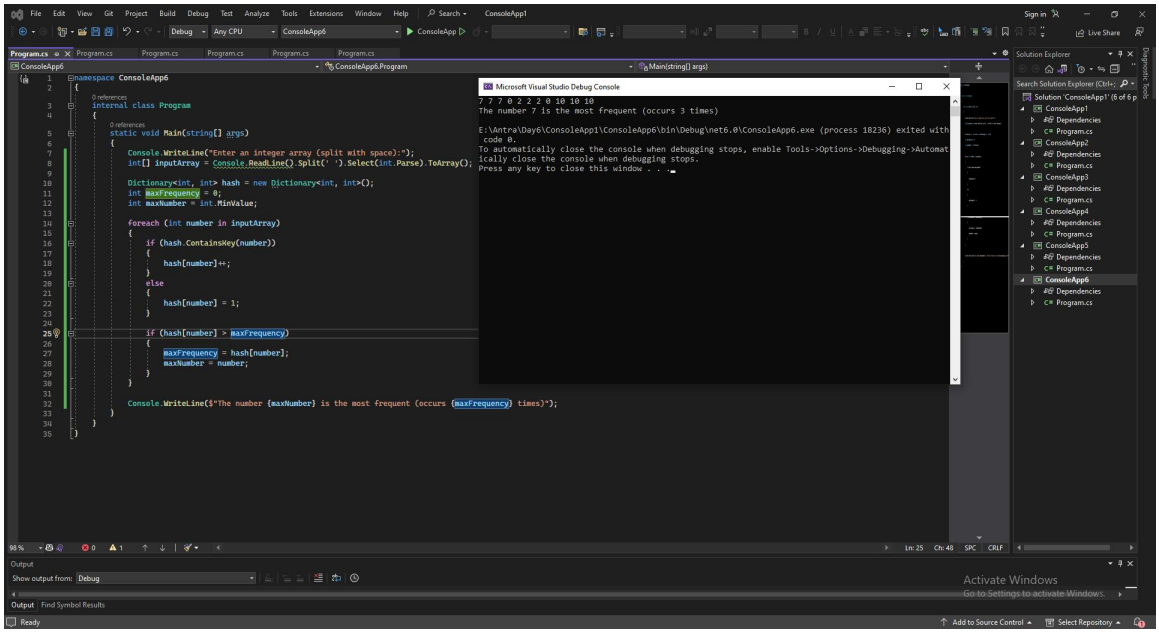
A: My answer can be seen as below:



7. Write a program that finds the most frequent number in a given sequence of numbers. In

case of multiple numbers with the same maximal frequency, print the leftmost of them
Input Output
4 1 1 4 2 3 4 4 1 2 4 9 3 The number 4 is the most frequent (occurs 5 times)
7 7 7 0 2 2 2 0 10 10 10 The numbers 2, 7 and 10 have the same maximal frequence (each occurs 3 times). The leftmost of them is 7.

A: My answer can be seen as below:



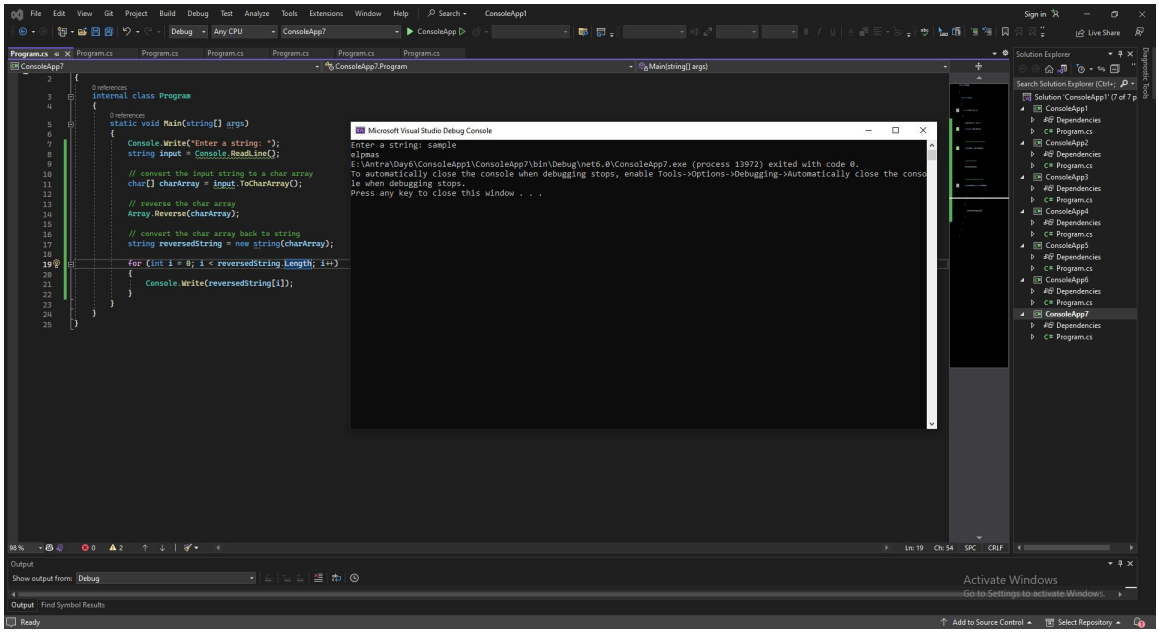
Practice Strings

1. Write a program that reads a string from the console, reverses its letters and prints the result back at the console.
Write in two ways

- **Convert the string to char array, reverse it, then convert it to string again**
- **Print the letters of the string in back direction (from the last to the first) in a for-loop**

Input Output
sample elpmas
24tvcoi92 29iocvt42

A: My answer can be seen as below:



2. Write a program that reverses the words in a given sentence without changing the punctuation and spaces

- **Use the following separators between the words: . , : ; = ( ) & [ ] " ' \ / ! ? (space).**
- **All other characters are considered part of words, e.g. C++, a+b, and a77 are considered valid words.**
- **The sentences always start by word and end by separator.**

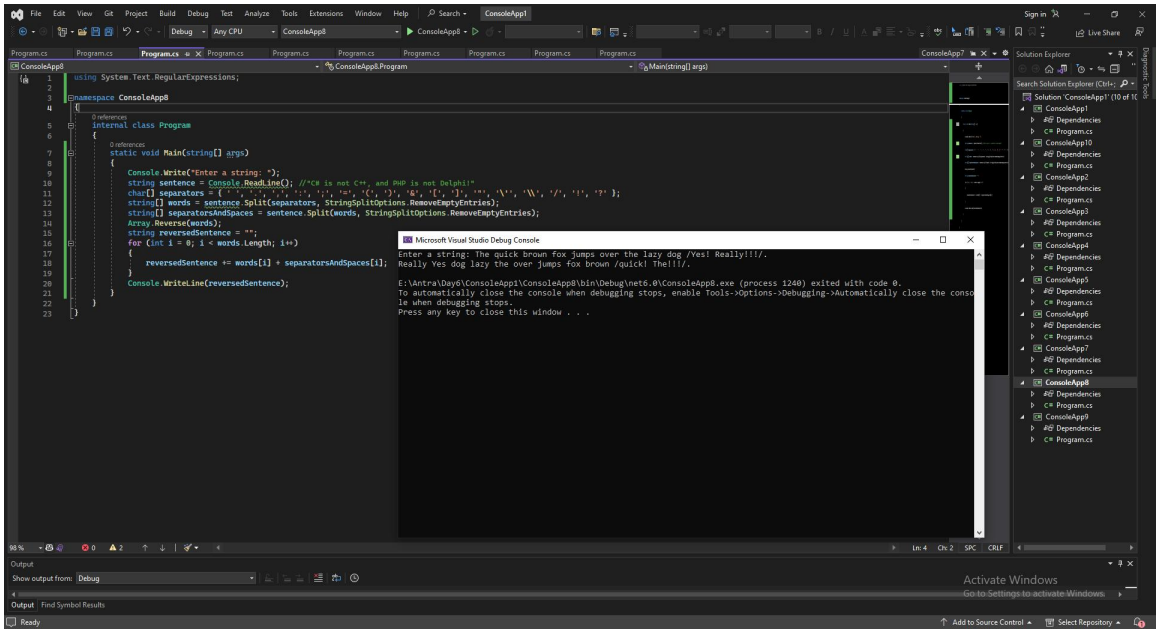
E.g C# is not C++, and PHP is not Delphi!

Delphi not is PHP, and C++ not is C#!

The quick brown fox jumps over the lazy dog /Yes! Really!!!/.

Really Yes dog lazy the over jumps fox brown /quick! The!!!/.

A: My answer can be seen as below:

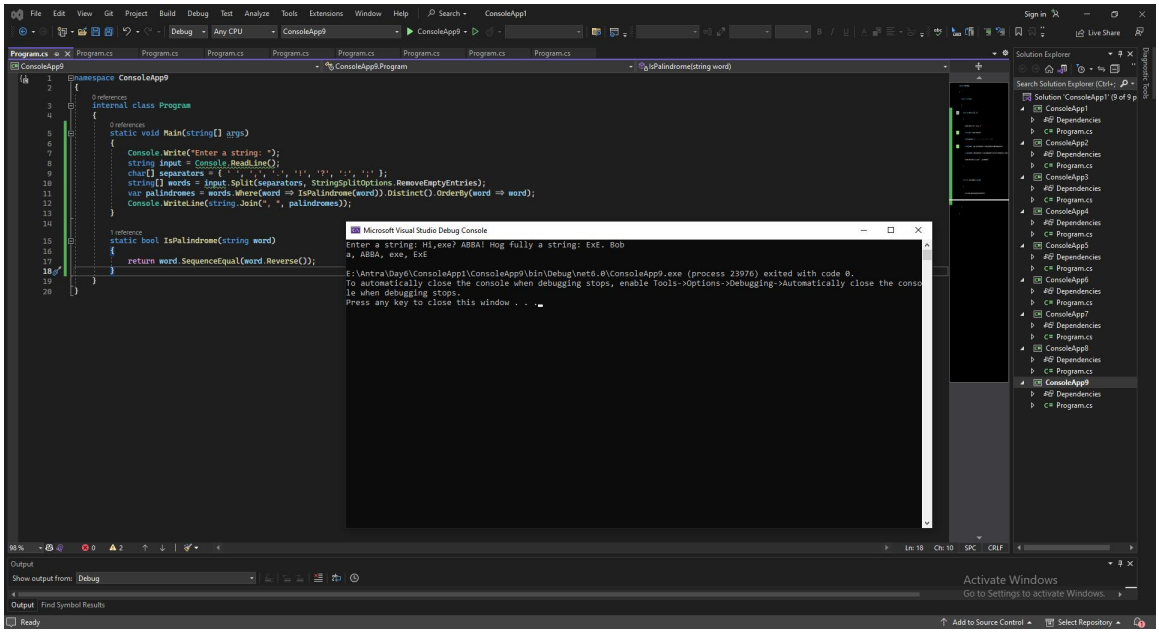


3. Write a program that extracts from a given text all palindromes, e.g. “ABBA”, “lamal”, “exe” and prints them on the console on a single line, separated by comma and space.Print all unique palindromes (no duplicates), sorted

Hi,exe? ABBA! Hog fully a string: ExE. Bob

a, ABBA, exe, ExE

A: My answer can be seen as below:



4. Write a program that parses an URL given in the following format:

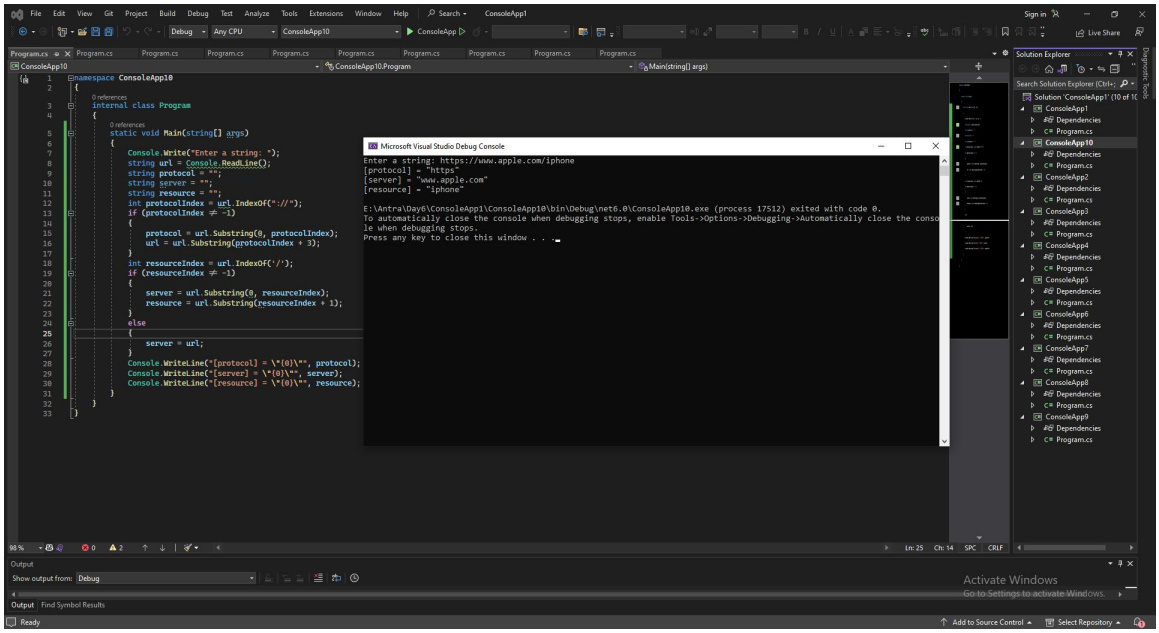
[protocol]://[server]/[resource]

The parsing extracts its parts: protocol, server and resource.

- **The [server] part is mandatory.**
- **The [protocol] and [resource] parts are optional.**

https://www.apple.com/iphone
[protocol] = "https"
[server] = "www.apple.com"
[resource] = "iphone"
ftp://www.example.com/employee
[protocol] = "ftp"
[server] = "www.example.com"
[resource] = "employee"
https://google.com
[protocol] = "https"
[server] = "google.com"
[resource] = ""
www.apple.com
[protocol] = ""
[server] = "www.apple.com"
[resource] = ""

A: My answer can be seen as below:



Explore the following Topics

- **Strings**
- **Arrays**
- **Using the StringBuilder**