

Assignment 1

Your high school friend writes to you that they have a client who needs some software developed, they pay well but you would have to work in C# and .NET. You quickly google them and say that it won't be a problem, just keep the money coming.

- Install Visual Studio Community Edition, selecting the following: .NET desktop development.

The client wants you to show that you know how to code, you take this as an interview, so you quickly solve:

1. Write a program that finds the length of the longest substring without repeating characters in a given string. For example, the longest substring without repeating letters in "abcabcbb" is "abc", with a length of 3.
2. Write a program that merges all overlapping intervals from a given collection of intervals. Each interval is represented as a pair of integers (start, end). For example, given $[[1,3],[2,6],[8,10],[15,18]]$, the program should output $[[1,6],[8,10],[15,18]]$.
3. Develop a program that performs the addition of two matrices. The program should prompt the user to input the dimensions of the matrices and the elements of each matrix.
4. Create a program that converts a decimal number (input by the user) to its binary equivalent. The output should be a string of binary digits.
5. Develop a program that checks if two strings are anagrams of each other. An anagram is a word or phrase formed by rearranging the letters of another word or phrase, using all the original letters exactly once.
6. Write a program to find the longest palindromic substring in a given string. For example, in the string "babad", one possible longest palindromic substring is "bab".
7. You are given an $n \times n$ 2D matrix representing an image. Rotate the image by 90 degrees (clockwise). You have to rotate the image in-place, which means you have to modify the input 2D matrix directly.
8. Create a program that converts between Celsius, Fahrenheit and Kelvin. Read the from, to and value from the keyboard and display the converted value.
9. Write a program that continuously displays the current time and date in decimal, hexadecimal, and binary. The program should clear the screen each second.
10. A palindromic number reads the same both ways. The largest palindrome made from the product of two 2-digit numbers is $9009 = 91 * 99$, Find the largest palindrome made from the product of two 3-digit numbers.
11. 2520 is the smallest number that can be divided by each of the numbers from 1 to 10 without any remainder. What is the smallest positive number that is divisible with no remainder by all the numbers from 1 to 20?

12. By listing the first six prime numbers: 2, 3, 4, 5, 11, and 13, we can see that the 6th prime is 13. What is the 10001st prime number?
13. By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.
14. Given two strings, one representing the letters available in a magazine and another representing a ransom note, write a program to determine if the ransom note can be constructed from the magazine letters. The program should ignore case and punctuation.
15. After reading a Sudoku puzzle solution, check whether the solution is valid.

- Deadline: end of lab 1