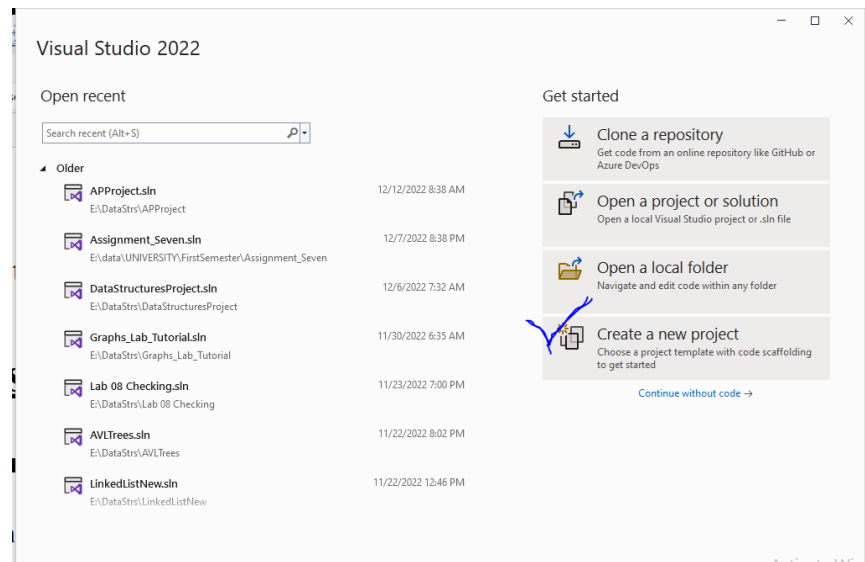**Data Structures Spring 2023**
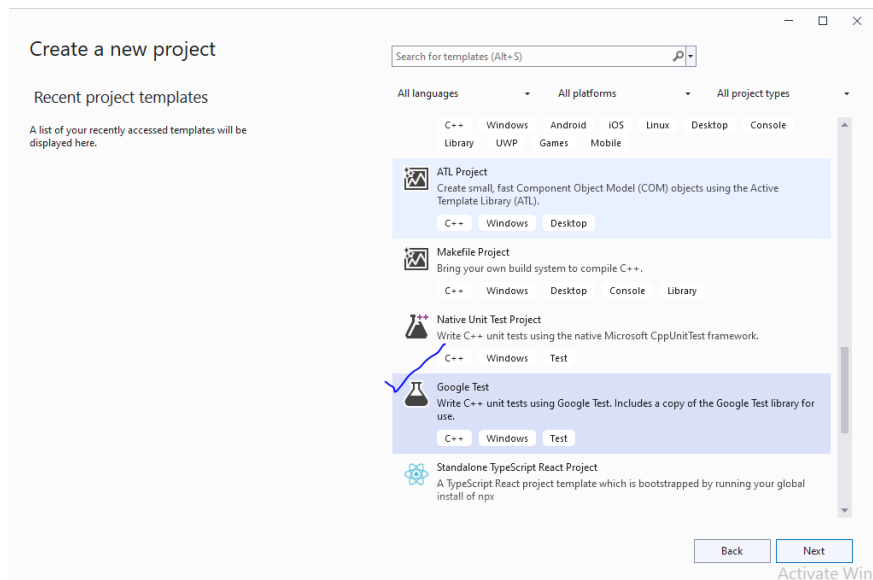
Lab Task 02: Templates and Unit Testing

Introduction to Unit Testing

Follow the following steps to create google test, that will be used to chcek your code.

Step 1: Make a visual studio project

Step 2:

Step 3:

Step 4:

This is how your file will look like
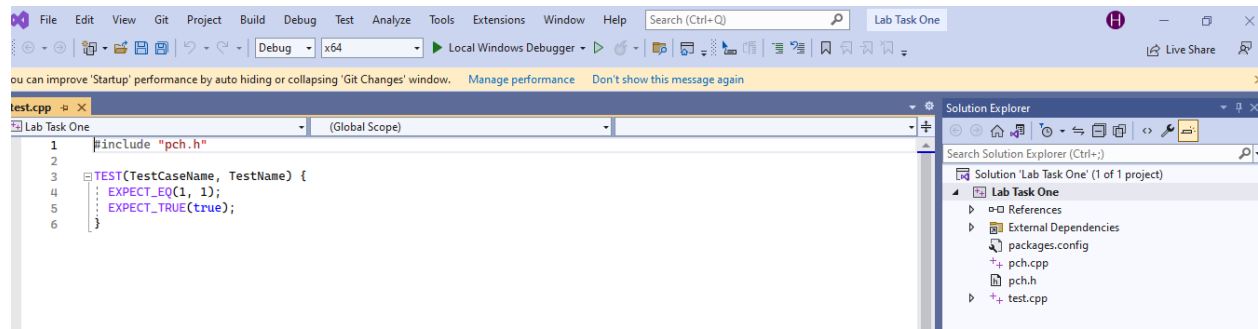
Lab Work

Task 1

Implement the calculator using templates.

1-   add to number

2-   add two arrays and return the sum in third.

3-   subtract two numbers

4-   div two numbers

5-   prime number

6-   factorial using recursion

7-   square root of number

Note: You must handle the exceptions.

Task 2

You're given an array; you have to split it into sets (possibly empty) such that:

1.   The difference between the sizes of these two sets must not exceed 1.

2.   The difference between the sum of elements of these two sets should be maximum possible.

The array is: [5, 3, 2 ,10]. Optimal splitting is: { 5, 10 }, { 3, 2 }. Difference between the sums of sets is 10.

Task 3

A string is said to be "SUPER STRING" if the number of times the character appeared in the string is equal to its ASCII value. Given the conditions that the ASCII value of 'A' is 26 and Z is '1'.

Example:

ZYYZ is not SUPER STRING (As Y appear 2 time and ASCII is 2 but Z's ASCII is 1 but appeared 2 time).

ZYY is SUPER STRING

Task 4

Write a program that takes a string as input and calculate the possible number of sub-string that are palindrome. But substring that are unique.

Recall that a palindrome is a non-empty string that reads the same backward as forward. Two sub-strings are considered to be different if they have different lengths or start at different positions in the original string.

For example string "ABBA" has possible 4 sub-string palindromes { A, B, BB, ABBA}

Task 5

We have a problem in C++ we cannot handle an integer number more than 8bytes. So the solution is to store the number (from input) as string and then to array;

1-   Your task is to convert the string input to array; str="111212919199199191910" to

1	1	1	2	1	2	9	1	9	1	9	9	1
9	9	1	9	1	9	1	0					

2-   Now take input for 2 arrays using above method and then add two arrays. For example

Array 1=

1	3	2	9	7	8	4	5	8	3

Array 2=

9	1	2	9	7	3	8	5	8	1

Resultant array=

1	0	4	5	9	5	2	3	1	6	4

3-   Subtract the arrays.