

C++ Programming

Recursive Functions

Homework 2

Mostafa S. Ibrahim

Teaching, Training and Coaching since more than a decade!

Artificial Intelligence & Computer Vision Researcher

PhD from Simon Fraser University - Canada

Bachelor / Msc from Cairo University - Egypt

Ex-(Software Engineer / ICPC World Finalist)



Homework 9: Right-Max

- Given array, change each element at position i to be the maximum of numbers from index i to end of array
- E.g. input 1 3 5 7 4 2 \Rightarrow [7, 7, 7, 7, 4, 2]
- `Void left_max(int arr[], int len, int start_position = 0);`

Homework 10: Suffix Sum

- Write a function that sums only the last N elements in an array.
- Define its signature
- Input [1, 3, 4, 6, 7], 3 \Rightarrow 17 (4+6+7)

Homework 11: Prefix Sum

- Write a function that sums only the first N elements in an array.
- Define its signature
- Input $[1, 3, 4, 6, 7]$, $3 \Rightarrow 8$ ($1+3+4$)

Homework 12: Is Palindrome

- Implement a function that decides if array is palindrome or not
- Define its signature

Homework 13: Is prefix

- `bool is_prefix(string main, string prefix, int start_pos = 0)`
- E.g. `is_prefix("abcdefgh", "abcd")` \Rightarrow true
- E.g. `is_prefix("abcdefgh", "")` \Rightarrow true
- E.g. `is_prefix("abcdefgh", "abd")` \Rightarrow false

Homework 14: Trace

- Without running code on the right
 - Trace by hand: What does this method do?
 - What happens if we swapped lines 6 & 7?

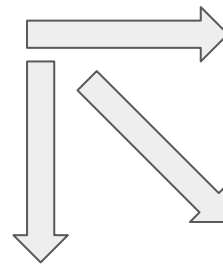
```
3
4 void do_something(int n) {
5     if (n) {
6         cout << n % 10;
7         do_something(n / 10);
8     }
9 }
10
11 int main() {
12     do_something(123456);
13     return 0;
14 }
```

Homework 15: Count primes

- `Int count_primes(int start, int end);`
 - Compute how many primes between start & end, inclusive indices
- Don't use loops at all
- Input
 - $10\ 20 \Rightarrow 4$
 - $10\ 200 \Rightarrow 42$
- Can u compute answer for $[10, 5000000]$?

Homework 16: Grid Sum

- Given a 2D array of numbers, all of them are positive distinct. Robot start from (0, 0). It can move to the **right or bottom or diagonal**. See the arrows.
- It will select one direction: the maximum. Print the total path sum of this robot
 - `int path_sum(int grid[100][100], int row, int col, int ROWS, int COLS)`
- Input
 - 3 3
 - 1 7 8
 - 2 10 11
 - 20 5 9
- Output: 31 (from 1 + 10 + 11 + 9)
 - Robot start at (0, 0). 3 possible values (2, 7, 10). Max 10, so go to this cell
 - Then 3 possible values (5, 9, 11). Go to 11. Then only 9 available



Homework 17: Fibonacci

- Implement fibonacci: `Int fibonacci(int n)`
 - Recall fibonacci sequence: 1 1 2 3 **5 8 13** 21 35
 - E.g. `fibonacci(6) = 13`
 - Recall that: `fibonacci(n) = fibonacci(n-1) + fibonacci(n-2)`. E.g. `fib(6) = fib(5)+fib(4) = 13`
 - So it calls 2 subproblems of its type
- Can u compute `fibonacci(40)`? `fibonacci(50)`? Why? Any work around? Hint:
Array

“Acquire knowledge and impart it to the people.”

“Seek knowledge from the Cradle to the Grave.”