Department of AI&ML

II YEAR-II SEMESTER

Subject: Operating Systems Using C++

Subject code: MR23-1CS0224

Holidays Assignment

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1. Conditional statements (Hacker rank)

Task

Read numbers from stdin and print their sum to stdout.

Input Format

One line that contains space 3-separated integers :a ,b , and c .

Constraints

1<=a,b,c<=1000

Output Format

Print the sum of the three numbers on a single line.

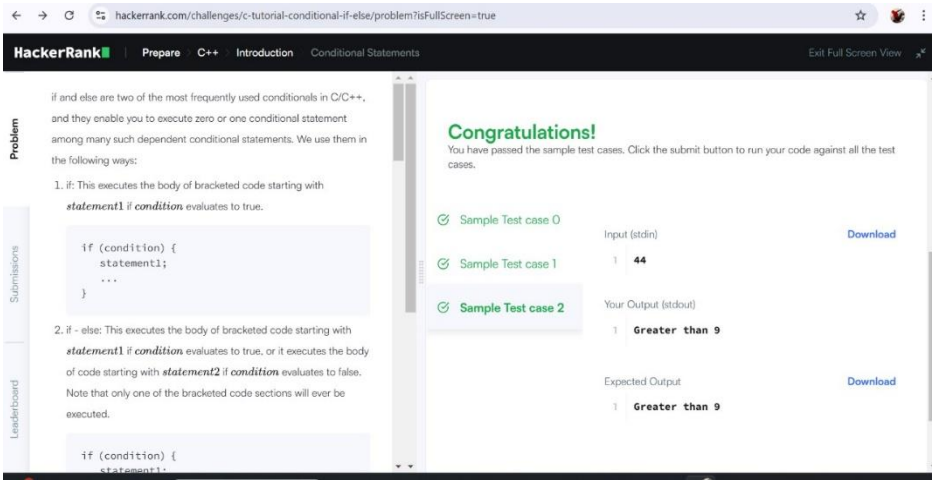
Sample Input

1 2 7

Sample Output

10

Ans.



2. Functions (Hacker rank)

Input Format

Input will contain four integers – a, b ,c, d.one per line.

Output Format

Return the greatest of the four integers.

PS: I/O will be automatically handled.

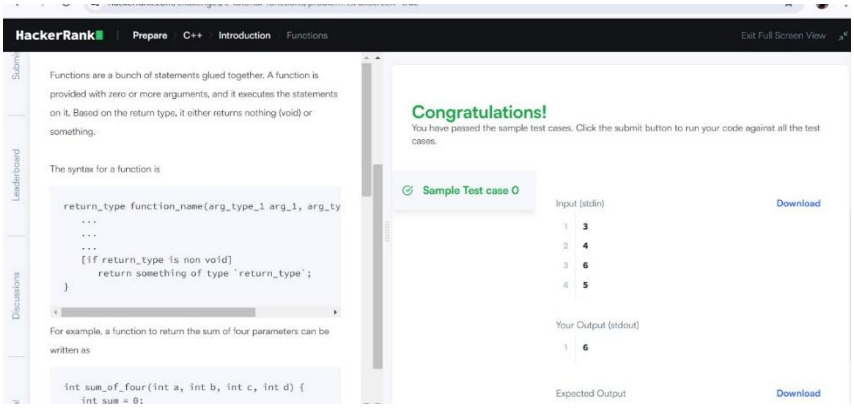
Sample Input

3
4
6
5

Sample Output

6

Ans.



3. Pointer (Hacker rank)

Input Format

Input will contain two integers a and b. separated by a newline.

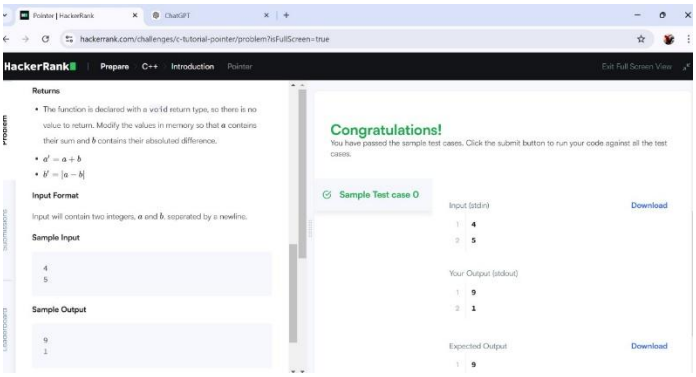
Sample Input

4
5

Sample Output

9
1

Ans.



4. Structures (Hacker rank)

You have to create a struct, named *Student*, representing the student's details, as mentioned above, and store the data of a student.

Input Format

Input will consist of four lines.

The first line will contain an integer, representing *age*.

The second line will contain a string, consisting of lower-case Latin characters ('a'-'z'), representing the *first_name* of a student.

The third line will contain another string, consisting of lower-case Latin characters ('a'-'z'), representing the *last_name* of a student.

The fourth line will contain an integer, representing the *standard* of student.

Note: The number of characters in *first_name* and *last_name* will not exceed 50.

Output Format

Output will be of a single line, consisting of *age*, *first_name*, *last_name* and *standard*, each separated by one white space. *P.S.:* I/O will be handled by HackerRank.

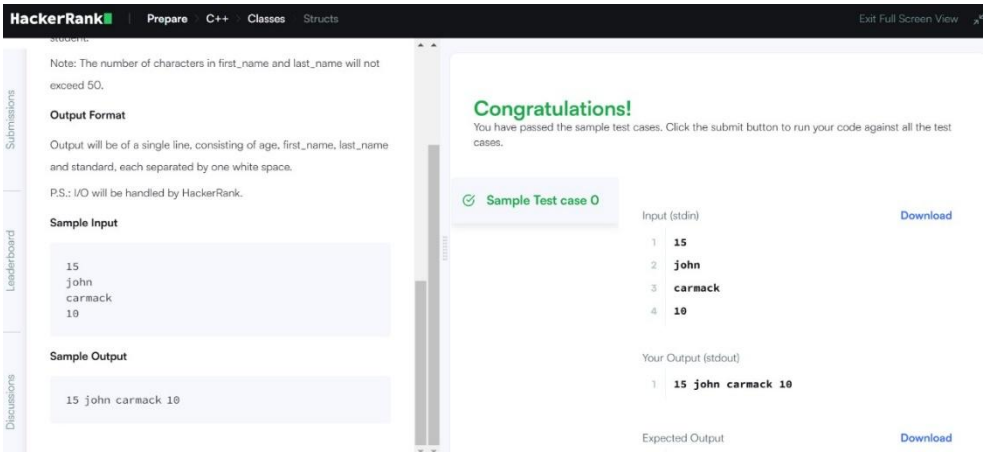
Sample Input

15 john
carmac
k
10

Sample Output

15 john carmack 10

Ans.



5. Strings (Hacker rank)

Input Format

You are given two strings a and b separated by a new line. Each string will consist of lower case Latin characters ('a'-'z').

Output Format

In the first line print two space-separated integers, representing the length of a and b respectively.

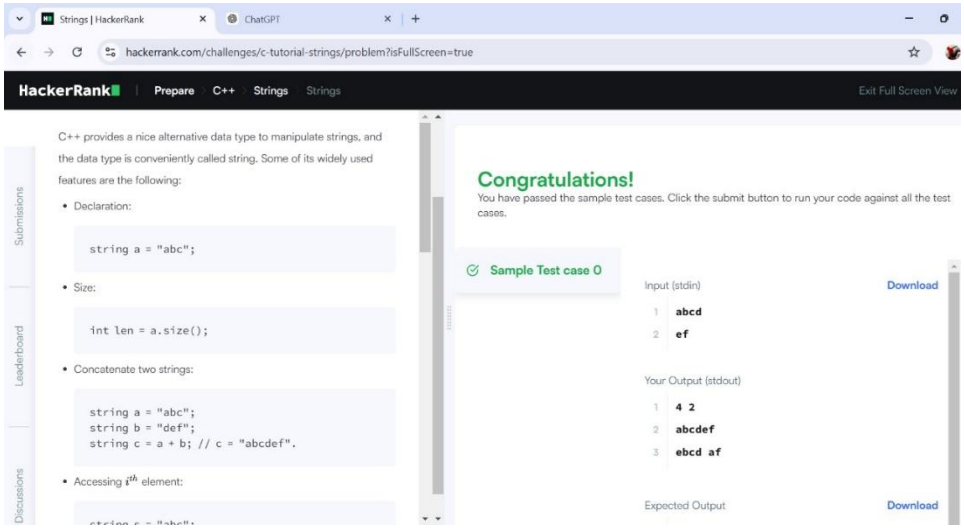
In the second line print the string produced by concatenating a and b (a+b).

In the third line print two strings separated by a space a' and b' and a' and b' are the same as a and b , respectively, except that their first characters are swapped. **Sample Input**

abcd ef

Sample Output

4 2 abcdef
ebcd af
Ans.



6. Recursion Problem (Hacker rank)

Task

Write a recursive function to calculate a^b (a raised to the power of b).

Input Format

1. Two integers a and b ($0 \leq a \leq 100$, $0 \leq b \leq 10$).

Constraints

- $0 \leq a \leq 100$
- $0 \leq b \leq 10$

Output Format

Print the result of a^b.

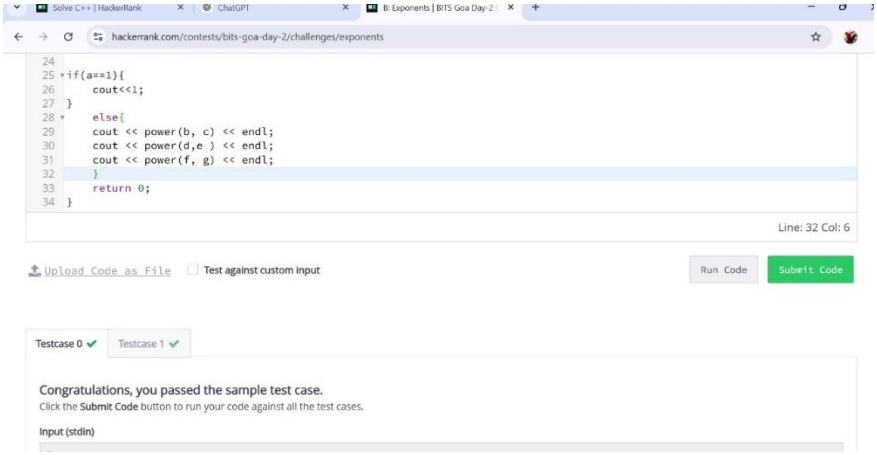
Sample Input

2 3

Sample Output

8

Ans.



7. Exception Handling (Hacker rank)

Problem Statement

Write a program that takes two integers a and b and calculates their division (a / b). If the divisor b is zero, the program should throw and handle an exception to avoid crashing.

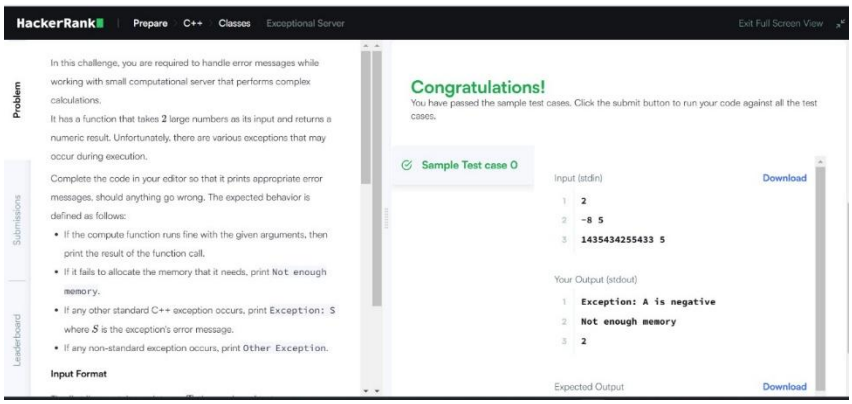
Input Format

1. Two space-separated integers a and b.

Constraints

$-10^9 \leq a, b \leq 10^9$

Ans.



8. For loop

Input Format

You will be given two positive integers, a and b (a<=b), separated by a newline.

Output Format

For each integer in the inclusive interval[a ,b] :

- If 1<=n<=9 , then print the English representation of it in lowercase. That is

  "one" for 1 , "two" for 2, and so on.

- Else if n>9 and it is an even number, then print "even".
- Else if n>9 and it is an odd number, then print "odd".

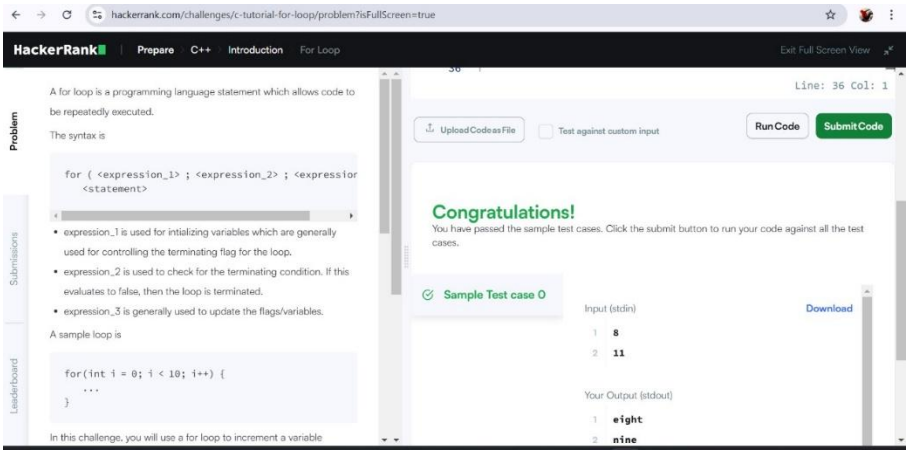
Sample Input

8
11

Sample Output

eight
nine
even odd

Ans.



9. Arrays (Leetcode)

There are a total of numCourses courses you have to take, labeled from 0 to numCourses - 1. You are given an array prerequisites where prerequisites[i] = [ai, bi] indicates that you must take course bi first if you want to take course ai.

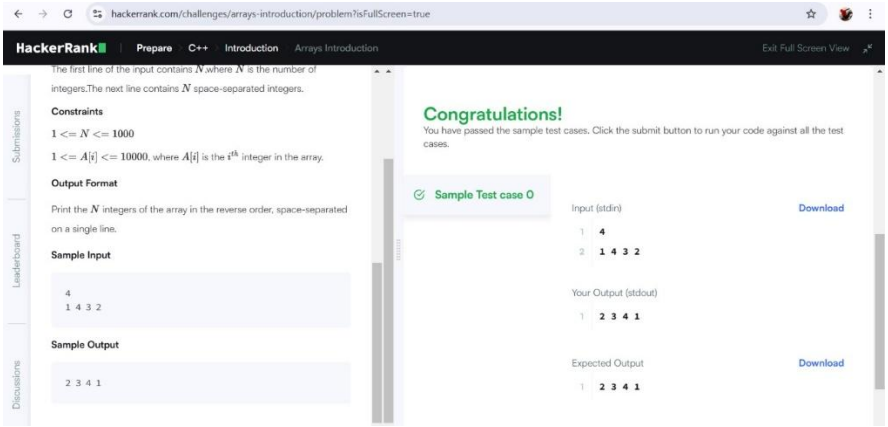
Input format:
For example, the pair [0, 1], indicates that to take course 0 you have to first take course 1.

Return true if you can finish all courses. Otherwise, return false.

Output Format

There are a total of 2 courses to take.
To take course 1 you should have finished course 0. So it is possible.

Ans.



10. Case study: Implement First come first serve and Shortest job first CPU scheduling algorithms using c++.

Ans.

1. First Come First Serve (FCFS) Scheduling

FCFS is the simplest CPU scheduling algorithm where the process that arrives first gets executed first.

```
#include <iostream>

#include <vector>

#include <algorithm>


using namespace std;


struct Process {
```

```
    int id;
    int arrivalTime;
    int burstTime;
    int completionTime;
    int waitingTime;
    int turnaroundTime;
};

void findWaitingTime(vector<Process>& processes) {
    processes[0].waitingTime = 0;
    for (int i = 1; i < processes.size(); i++) {
        processes[i].waitingTime = processes[i - 1].completionTime -
processes[i].arrivalTime;
    }
}

void findTurnaroundTime(vector<Process>& processes) {
    for (int i = 0; i < processes.size(); i++) {
        processes[i].turnaroundTime = processes[i].burstTime +
processes[i].waitingTime;
    }
}

void findCompletionTime(vector<Process>& processes) {
```

```
    processes[0].completionTime = processes[0].arrivalTime +
processes[0].burstTime;

    for (int i = 1; i < processes.size(); i++) {

        processes[i].completionTime = max(processes[i].arrivalTime,
processes[i - 1].completionTime) + processes[i].burstTime;

    }

}


void FCFS(vector<Process>& processes) {

    findCompletionTime(processes);

    findWaitingTime(processes);

    findTurnaroundTime(processes);


    cout << "Process ID\tArrival Time\tBurst Time\tCompletion Time\tWaiting
Time\tTurnaround Time" << endl;

    for (auto& process : processes) {

        cout << process.id << "\t\t" << process.arrivalTime << "\t\t" <<
process.burstTime << "\t\t"

            << process.completionTime << "\t\t" << process.waitingTime <<
"\t\t" << process.turnaroundTime << endl;

    }

}


int main() {

    vector<Process> processes = {{1, 0, 5}, {2, 1, 3}, {3, 2, 8}, {4, 3, 6}};

    FCFS(processes);
```

```
    return 0;
}
```

Explanation:

- **Process Structure:** Contains the process ID, arrival time, burst time, completion time, waiting time, and turnaround time.
- **findWaitingTime():** Calculates the waiting time for each process.
- **findTurnaroundTime():** Calculates the turnaround time for each process.
- **findCompletionTime():** Calculates the completion time for each process based on FCFS logic.
- **FCFS():** Main function that calls other functions and prints the results.

2. Shortest Job First (SJF) Scheduling

SJF is a non-preemptive CPU scheduling algorithm that selects the process with the shortest burst time for execution next.

```
#include <iostream>
#include <vector>
#include <algorithm>

using namespace std;

struct Process {
    int id;
    int arrivalTime;
    int burstTime;
    int completionTime;
    int waitingTime;
```

```
    int turnaroundTime;
};

bool compare(Process p1, Process p2) {
    return p1.burstTime < p2.burstTime;
}

void findWaitingTime(vector<Process>& processes) {
    processes[0].waitingTime = 0;
    for (int i = 1; i < processes.size(); i++) {
        processes[i].waitingTime = processes[i - 1].completionTime -
processes[i].arrivalTime;
    }
}

void findTurnaroundTime(vector<Process>& processes) {
    for (int i = 0; i < processes.size(); i++) {
        processes[i].turnaroundTime = processes[i].burstTime +
processes[i].waitingTime;
    }
}

void findCompletionTime(vector<Process>& processes) {
    processes[0].completionTime = processes[0].arrivalTime +
processes[0].burstTime;
```

```
    for (int i = 1; i < processes.size(); i++) {
        processes[i].completionTime = max(processes[i].arrivalTime,
processes[i - 1].completionTime) + processes[i].burstTime;
    }
}

void SJF(vector<Process>& processes) {
    sort(processes.begin(), processes.end(), compare); // Sort processes by
burst time (Shortest Job First)

    findCompletionTime(processes);
    findWaitingTime(processes);
    findTurnaroundTime(processes);

    cout << "Process ID\tArrival Time\tBurst Time\tCompletion Time\tWaiting
Time\tTurnaround Time" << endl;
    for (auto& process : processes) {
        cout << process.id << "\t\t" << process.arrivalTime << "\t\t" <<
process.burstTime << "\t\t"
             << process.completionTime << "\t\t" << process.waitingTime <<
"\t\t" << process.turnaroundTime << endl;
    }
}

int main() {
    vector<Process> processes = {{1, 0, 6}, {2, 1, 8}, {3, 2, 7}, {4, 3, 3}};
```

```
    SJF(processes);

    return 0;

}
```

Explanation:

- **compare():** Function to sort processes by burst time (for SJF).
- **findWaitingTime(), findTurnaroundTime(), findCompletionTime():** Functions similar to FCFS, calculating the corresponding times.
- **SJF():** Main function for SJF scheduling that sorts processes and then calculates the times.

Output Example:

For FCFS:

Process ID	Arrival Time	Burst Time	Completion Time	Waiting Time	Turnaround Time
1	0	5	5	0	5
2	1	3	8	4	7
3	2	8	16	6	14
4	3	6	22	13	19

For SJF:

Process ID	Arrival Time	Burst Time	Completion Time	Waiting Time	Turnaround Time
4	3	3	6	0	3
1	0	6	12	3	9
3	2	7	19	10	17
2	1	8	27	18	2