

HEAVEN'S LIGHT IS OUR GUIDE



RAJSHAHI UNIVERSITY OF ENGINEERING AND TECHNOLOGY

CSE-2102

LAB-5

Discrete Mathematics Sessional

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1 Infinite Sum

Calculate the sum

$$1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$$

1.1 Source Code

```

1  #include <bits/stdc++.h>
2  using namespace std;
3  int main(){
4      int a = 1;
5      float r = 0.5;
6      cout << "Sum = " << a / (1 - r) << endl;
7  }

```

1.2 Output

Sum = 2

Figure 1: Sum of the infinite series

1.3 Analysis

The complexity of the code is $O(1)$. Because the sum is calculated using the formula

$$S_{\infty} = \frac{a}{1-r}, |r| < 1$$

Here, the common ratio $r = \frac{1}{2}$ which satisfies the condition to have infinite sum.

2 Double Summation

Find the value of $\sum_{i=L_1}^{U_1} \sum_{j=L_2}^{U_2} (i + j)$. Take lower bound L_1, L_2 and upper bound U_1, U_2 as user input.

2.1 Source Code

```

1  #include <bits/stdc++.h>
2  using namespace std;
3
4  int main(){
5
6      int L1, L2, U1, U2;
7      cout << "L1: "; cin >> L1;
8      cout << "U1: "; cin >> U1;
9      cout << "L2: "; cin >> L2;
10     cout << "U2: "; cin >> U2;
11
12     long long sum = 0;
13     for(int i = L1; i <= U1; i++){
14         for(int j = L2; j <= U2; j++){
15             sum += (i+j);
16         }
17     }
18     cout << "Sum: " << sum << endl;
19     return 0;
20 }
```

2.2 Output

```

L1: 1
U1: 10
L2: 1
U2: 5
Sum: 425

```

Figure 2

2.3 Analysis

The double summation is implemented using nested for loop. The loop iteration depends on the lower bound and upper bound taken input from the user. The complexity of the code is $O(n \cdot m)$ here $n = (U_1 - L_1) + 1$ and $m = (U_2 - L_2) + 1$. Considering $n = m$ it can be further simplified that the complexity is $O(n^2)$.