

Name: **Kashif Ali**  
Roll No: **20K-1890**

Section: **3D**  
**Lab Task 3**

```
25  #include<iostream>
26  using namespace std;
27
28  int main ()
29  {
30      int n;
31      int Sum = 0;
32      cout<<"Enter how many numbers: ";
33      cin>>n;
34      for (int i = 0; i < n; i++)
35      {
36          /* code */
37          Sum+=i;
38
39          Sum+=1;
40          cout<<Sum<<" ";
41      }
42      cout<<endl;
43
44  }
```

Task 1A through Loop  
Outputs are also given

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

kashiii@kashiii:~/Downloads/DS-Lab03\$ cd "/home/kashiii/Downloads/DS-Lab03"

kashiii@kashiii:~/Downloads/DS-Lab03\$ ./"task1"

Enter how many numbers: 10

1 3 6 10 15 21 28 36 45 55

kashiii@kashiii:~/Downloads/DS-Lab03\$ cd "/home/kashiii/Downloads/DS-Lab03"

kashiii@kashiii:~/Downloads/DS-Lab03\$ ./"task1"

Enter how many numbers: 19

1 3 6 10 15 21 28 36 45 55 66 78 91 105 120 136 153 171 190

kashiii@kashiii:~/Downloads/DS-Lab03\$

Compiled successfully!

```
93 // Task 1A Through Function recursion
94
95 #include<iostream>
96 using namespace std;
97 int seq_generate(int n)
98 {
99     int sum = 0;
100
101     if(n==0){
102         return 0;
103     }
104
105     return n+seq_generate(n-1);
106 }
107
108 int main(){
109
110     int n;
111     cout<<"Enter any Number for sequence: ";
112     cin>>n;
113     for (int i = 0; i < n; i++)
114     {
115         /* code */
116         cout<<seq_generate(i)<<" ";
117     }
118     return 0;
119 }
```

Task 1A through function  
**Recursion**  
Outputs are given in the next slide

task1.cpp &gt; seq\_generate(int)

```
92
93 // Task 1A Through Function recursion
94
95 #include<iostream>
96 using namespace std;
97 int seq_generate(int n)
98 {
99     int sum = 0;
100
101     if(n==0){
102         return 0;
103     }
104
```

PROBLEMS OUTPUT TERMINAL ...

C/C++ Compile Run + v □ □ ^ x

```
kashiii@kashiii:~/Downloads/DS-Lab03$ cd "/home/kashiii/Downloads/DS-
Lab03"
```

```
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
```

```
Enter any Number for sequence: 10
```

```
0 1 3 6 10 15 21 28 36 45 kashiii@kashiii:~/Downloads/DS-Lab03$ cd "/"
home/kashiii/Downloads/DS-Lab03"
```

```
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
```

```
Enter any Number for sequence: 20
```

```
0 1 3 6 10 15 21 28 36 45 55 66 78 91 105 120 136 153 171 190 kashiii
@kashiii:~/Downloads/DS-Lab03$
```

Task 1A outputs  
Recursion is used in this  
Code is given in the previous slide

```
69
70 // Task 1B Through Loop
71
72 #include<iostream>
73 using namespace std;
74
75 int main(){
76
77     int num, first = 1, second =0;
78
79     cout<<"Enter the Number of Series: ";
80     cin>>num;
81
82     for (int i = 0; i < num; i++)
83     {
84         /* code */
85         first = first+second;
86         cout<<first<<" ";
87         second++;
88     }
89
90
91     return 0;
92 }
```

Task 1B  
Through loop outputs are  
Given in the next slide

task1.cpp > main()

```
69
70 // Task 1B Through Loop
71
72 #include<iostream>
73 using namespace std;
74
75 int main(){
76
77     int num, first = 1, second =0;
78
79     cout<<"Enter the Number of Series: ";
80     cin>>num;
81
82     for (int i = 0; i < num; i++)
83     {
84         /* code */
85         first = first+second;
86         cout<<first<<" ";
```

These are the outputs of Task 1B  
By using Loop

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

kashiii@kashiii:~/Downloads/DS-Lab03\$ cd "/home/kashiii/Downloads/DS-Lab03"

kashiii@kashiii:~/Downloads/DS-Lab03\$ ./"task1"

Enter the Number of Series: 10

1 2 4 7 11 16 22 29 37 46 kashiii@kashiii:~/Downloads/DS-Lab03\$ cd "/home/kashiii/Downloads/DS-Lab03"

kashiii@kashiii:~/Downloads/DS-Lab03\$ ./"task1"

Enter the Number of Series: 23

1 2 4 7 11 16 22 29 37 46 56 67 79 92 106 121 137 154 172 191 211 232 254 kashiii@kashiii:~/Downloads/DS-Lab03\$

```
93
94
95 // Task 1B Through Function recursion
96
97 #include<iostream>
98 using namespace std;
99 int seq_generate(int n)
100 {
101     int sum = 0;
102
103     if(n==0){
104         return 0;
105     }
106
107     return n+seq_generate(n-1);
108 }
109
110 int main(){
111
112     int n;
113     cout<<"Enter any Number for sequence: ";
114     cin>>n;
115     for (int i = 0; i < n; i++)
116     {
117         /* code */
118         cout<<seq_generate(i)+1<<" ";
119     }
120     return 0;
121 }
```

Task 1B through function recursion  
Code  
Outputs are given in the next slide



task1.cpp > seq\_generate(int)

```
95 // Task 1B Through Function recursion
96
97 #include<iostream>
98 using namespace std;
99 int seq_generate(int n)
100 {
101     int sum = 0;
102
103     if(n==0){
104         return 0;
105     }
106
107     return n+seq_generate(n-1);
108 }
109
110 int main(){
```

Task 1B through recursion  
Outputs  
Code is given in the previous slide

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

kashiii@kashiii:~/Downloads/DS-Lab03\$ cd "/home/kashiii/Downloads/DS-Lab03"

kashiii@kashiii:~/Downloads/DS-Lab03\$ ./"task1"

Enter any Number for sequence: 11

1 2 4 7 11 16 22 29 37 46 56 kashiii@kashiii:~/Downloads/DS-Lab03\$ cd "/home/kashiii/Downloads/DS-Lab03"

./"task1"

kashiii@kashiii:~/Downloads/DS-Lab03\$ ./"task1"

Enter any Number for sequence: 25

1 2 4 7 11 16 22 29 37 46 56 67 79 92 106 121 137 154 172 191 211 232 254 277 301 kashiii@kashiii:~/Downloads/DS-Lab03\$



```
124 // Task 3
125 #include<iostream>
126 using namespace std;
127
128 void seq(int); // Function Prototypes
129 void funct(int, int);
130
131 void seq(int x)
132 {
133     static int n =1;
134     x = x+n;
135     n++;
136     funct(x,n);
137 }
138
139 void funct(int b, int n)
140 {
141     if(n>=8)
142         exit(1);
143     else{
144         cout<<b<<" ";
145         seq(b);
146     }
147 }
148
149 int main(){
150
151     seq(0);
152
153     return 0;
154 }
```

Task 3 code

task1.cpp x

task1.cpp > seq(int)

```
124 // Task 3
125 #include<iostream>
126 using namespace std;
127
128 void seq(int); // Function Prototypes
129 void funct(int, int);
130
131 void seq(int x)
132 {
133     static int n = 1;
```

Task 3 output

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

```
kashiii@kashiii:~/Downloads/DS-Lab03$ cd "/home/kashiii/Downloads/DS-Lab03"
```

```
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
```

```
1 3 6 10 15 21 kashiii@kashiii:~/Downloads/DS-Lab03$ cd "/home/kashiii/Downloads/DS-Lab03"
```

```
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
```

```
kashiii@kashiii:~/Downloads/DS-Lab03$
```

```
156 // Task 4
157
158 #include<iostream>
159 using namespace std;
160
161 int fun1(int arr[], int i, int j)
162 {
163     if(i==j)
164         return j;
165
166     int x = fun1(arr,i+1,j);
167     if(arr[i]<arr[x])
168     {
169         return i;
170     }
171     else
172         return x;
173 }
174 void recursion_fun(int arr[], int size, int index = 0)
175 {
176     if(index==size)
177     {
178         return;
179     }
180     int k= fun1(arr, index, size-1);
181     if(k!=index)
182     {
183
184     }
185     swap(arr[k], arr[index]);
186     recursion_fun(arr,size,index+1);
187 }
188
189 int main(){
190
191     int arr[] = {2, 3, 4, 5, 6};
192     int size = sizeof(arr)/sizeof(arr[0]);
193     recursion_fun(arr, size);
194     for (int i = 0; i < size; i++)
195     {
196         /* code */
197         cout<<arr[i]<<" ";
198         cout<<endl;
199     }
200
201     return 0;
202 }
```

Task 4 code  
Outputs are given in  
The next slide

## Nested Recursion

### Sample Code

```
#include <iostream>
using namespace std;

int fun(int n)
{
    if (n > 100)
        return n - 10;

    // A recursive function passing parameter
    // as a recursive call or recursion inside
    // the recursion
    return fun(fun(n + 11));
}

int main()
{
    int r;
    r = fun(95);

    cout << " " << r;

    return 0;
}
```

Dry Run is given in the  
Next line

## DS Lab Task #04

$x = ?$

$\therefore n = 95$

$\rightarrow n = 106$  (✓) Condition True

$n = 96$

$n = 107$  (✓) (-10)

$n = 97$

$n = 108$  (-10)

$n = 98$

$n = 109$  (-10)

$n = 99$

$n = 110$  (-10)

$n = 100$

$n = 111$  (-10)

$\rightarrow$  Backward Process starts.

$n = 101$

$n = 100$

$n = 99$

$n = 98$

$n = 97$

$n = 96$

$n = 95$

~~$n =$~~

$x = 91$

cout << "x is " << endl;

Dry Run Code

```
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
kashiii@kashiii:~/Downloads/DS-Lab03$ cd "/home/kashiii/Downloads/DS-Lab03"
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
2
3
4
5
6
kashiii@kashiii:~/Downloads/DS-Lab03$ cd "/home/kashiii/Downloads/DS-Lab03"
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
2
3
4
5
6
kashiii@kashiii:~/Downloads/DS-Lab03$ █
```

```
204 // TASK 5
205
206
207 #include<iostream>
208 using namespace std;
209
210 #define N 4
211
212 bool solveMazeUtil(int maze[N][N], int x, int y, int sol[N][N]);
213
214 void printSolution(int sol[N][N])
215 {
216     for (int i = 0; i < N; i++)
217     {
218         for (int j = 0; j < N; j++)
219         {
220             cout<<sol[i][j]<<" ";
221         }
222         cout<<"\n";
223     }
224 }
225
226 }
227
228 bool isSafe(int maze[N][N], int x, int y)
229 {
230     if ( x>=0 && x<N && y>=0 && y<N && maze[x][y]==1)
231         return true;
232
233     return false;
234 }
235
```

Task 5 code  
Code is continues  
In the next slide



```
236 bool solveMaze(int maze[N][N])
237 {
238     int sol[N][N] = {{0, 0, 0, 0},
239                     {0, 0, 0, 0},
240                     {0, 0, 0, 0},
241                     {0, 0, 0, 0}};
242
243     if (solveMazeUtil(maze, 0, 0, sol)==false) {
244         cout<<"Solution Doesn't Exist ";
245         return false;
246     }
247
248     printSolution(sol);
249     return true;
250 }
251
252 bool solveMazeUtil(int maze[N][N], int x, int y, int sol[N][N])
253 {
254     if (x == N-1 && y == N -1 && maze[x][y]==1) {
255         sol[x][y] =1;
256         return true;
257     }
258
259     if(isSafe(maze, x, y)==true) {
260         if (sol[x][y] == 1)
261             return false;
262
263         sol[x][y] = 1;
264
265         if(solveMazeUtil(maze, x+1, y, sol)==true)
266             return true;
267     }
```

task1.cpp &gt; printSolution(int [N][N])

```
267
268     if(solveMazeUtil(maze, x, y+1, sol)==true)
269         return true;
270
271     sol[x][y] = 0;
272     return false;
273 }
274
275 return false;
276
277
278 }
279
280 int main(){\
281     int maze[N][N] = {{1, 0, 0, 0},
282                       {1, 1, 0, 1},
283                       {0, 1, 0, 0},
284                       {1, 1, 1, 1}};
285
286     solveMaze(maze);
287
288
289     return 0;
290 }
```

Task 5 code 3  
Outputs are given in the  
Next slide

task1.cpp > main()

```
280 int main() {\
281     int maze[N][N] = {{1, 0, 0, 0},
282                       {1, 1, 0, 1},
283                       {0, 1, 0, 0},
284                       {1, 1, 1, 1}};
285
286     solveMaze(maze);
287
288
289     return 0;
290 }
```

Outputs of Task 5  
Codes are given in the  
Previous 3 slides

PROBLEMS OUTPUT TERMINAL DEBUG CONSOLE

```
kashiii@kashiii:~/Downloads/DS-Lab03$ cd "/home/kashiii/Downloads/DS-Lab03"
kashiii@kashiii:~/Downloads/DS-Lab03$ ./"task1"
```

```
1 0 0 0
1 1 0 0
0 1 0 0
0 1 1 1
```

```
kashiii@kashiii:~/Downloads/DS-Lab03$
```