

C++ Programming For Loops

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While \Rightarrow For

This is the while loop:

```
// Initialization
while (condition)
{
    // Code
    // Code
    // ....

    // Step
}
```



This is the for loop:

```
for (initialization ; condition ; step)
{
    // Code
    // Code
}
```

While \Rightarrow For

```
4 int main() {
5     int x = 1;
6     int sum = 0;
7
8     while (x < 6)
9     {
10         sum += x;
11         ++x;
12     }
13     cout<<sum;
14
15     return 0;
16 }
17
```

Problems Console Tasks

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15|



```
4 int main() {
5     int sum = 0;
6
7     for (int x = 1; x < 6; ++x)
8         sum += x;
9
10    cout<<sum;
11
12    return 0;
13 }
14
```

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Order

- Initialization
- Condition
- Body
- Step
- Condition
- Body
- Step
- Condition
- Body
- Step
- ...
- Condition
 - END

Nested for loops

```
4 int main() {  
5     int T;  
6     cin >> T;  
7  
8     for (int t = 0; t < T; ++t) {  
9         int num, sum = 0;  
10        cin >> num;  
11  
12        for (int start = 1; start <= num; ++start)  
13            sum += start;  
14  
15        cout << "Sum from 1 to " << num << " = " << sum << "\n";  
16    }  
17    return 0;  
18 }  
19
```

- Read T test cases
 - Read integer N
 - Print sum from 1 to N

Problems Console Tasks Properties Call Graph Search

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```
3  
3  
Sum from 1 to 3 = 6  
4  
Sum from 1 to 4 = 10  
5  
Sum from 1 to 5 = 15  
|
```

Loop empty parts

```
4 int main() {
5     int T;
6     cin >> T;
7
8     for (int t = 0; t < T; ++t) {
9         int num, sum = 0;
10        cin >> num;
11
12        int start = 1;
13        for (; start <= num; ) {
14            sum += start;
15            ++start;
16        }
17
18        cout << "Sum from 1 to " << num << " = " << sum << "\n";
19    }
20    return 0;
21 }
22
```

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```
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3
3
Sum from 1 to 3 = 6
4
Sum from 1 to 4 = 10
5
Sum from 1 to 5 = 15
|
```

- We can remove 2 elements of the for loops, now exactly while loop

Loop empty parts

```
3
4 int main() {
5     int T;
6     cin >> T;
7
8     for (int t = 0; t < T; ++t) {
9         int num, sum = 0;
10        cin >> num;
11
12        int start = 1;
13        for (; ;) { // same as while (true)
14            if (!(start <= num))
15                break;
16            sum += start;
17            ++start;
18        }
19
20        cout << "Sum from 1 to " << num << " = " << sum << "\n";
21    }
22    return 0;
23 }
```

- We can even remove the 3 elements!
- This is then an infinite loop
 - The break helps stopping it

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<terminated> ztemp [C/C++ Application] /home/moustafa/workspaces/eclipse_cp

```
3
3
Sum from 1 to 3 = 6
4
Sum from 1 to 4 = 10
5
Sum from 1 to 5 = 15
|
```

Common Errors

```
for (int i = 0; i < 10; ++i)    // works 10 times [0-9]
    cout<<i<<"\n";

for (int i = 0; i < 10; ++i);    // WRONG semicolon
    cout<<"Hello world\n";

for (int i = 0; i < 10; ++i)
    cout<<i++<<"\n";           // Sure to increment here too?
```

“Acquire knowledge and impart it to the people.”

“Seek knowledge from the Cradle to the Grave.”