



C++ Basics Overview

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Here's a brief overview of the basics in C++, including code snippets:

1. Data Types

C++ offers several built-in data types:

- **int**: Integer (e.g., `int x = 5;`)
- **float**: Floating-point number (e.g., `float y = 5.5;`)
- **char**: Character (e.g., `char z = 'A';`)
- **bool**: Boolean (e.g., `bool isTrue = true;`)
- **double**: Double-precision floating-point number (e.g., `double w = 5.55;`)

2. If-Else Statements

Used for conditional logic.

cpp

```
int x = 10;
if (x > 0) {
    cout << "Positive";
} else {
    cout << "Non-positive";
}
```

3. Switch Statement

Alternative to multiple if-else statements.

cpp

```
int day = 3;
switch (day) {
    case 1: cout << "Monday"; break;
    case 2: cout << "Tuesday"; break;
    case 3: cout << "Wednesday"; break;
}
```

```
    default: cout << "Invalid";
}
```

4. Arrays & Strings

- **Array:** Collection of elements of the same type.

cpp

```
int arr[3] = {1, 2, 3};
```

- **String:** Sequence of characters.

cpp

```
string str = "Hello";
```

5. For Loops

Iterate over a range of values.

cpp

```
for (int i = 0; i < 5; i++) {
    cout << i << " ";
}
```

6. While Loops

Loop that continues until a condition is false.

cpp

```
int i = 0;
while (i < 5) {
    cout << i << " ";
    i++;
}
```

7. Functions (Pass by Value & Reference)

- **Pass by Value:** Copies the argument.

cpp

```
void byValue(int a) {
    a = 10;
```

```
}
```

- **Pass by Reference:** Passes the original argument.

```
cpp
```

```
void byReference(int &a) {
    a = 10;
}
```

8. Time Complexity (Basics)

Time complexity is used to analyze the efficiency of an algorithm. Here's a basic example:

- **$O(1)$:** Constant time.

```
cpp
```

```
int x = 5;    // Always takes the same time.
```

- **$O(n)$:** Linear time.

```
cpp
```

```
for (int i = 0; i < n; i++) {
    cout << i << " ";
}
```

- **$O(n^2)$:** Quadratic time.

```
cpp
```

```
for (int i = 0; i < n; i++) {
    for (int j = 0; j < n; j++) {
        cout << i << " " << j << " ";
    }
}
```

This provides a foundational understanding of basic C++ concepts and how to measure their efficiency using time complexity.

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```
#include<bits/stdc++.h>
using namespace std;
void patone(int n){
    for(int i=0;i<n;i++){
        for(int j=0;j<n;j++){
            cout<<"*";
        }
        cout<<endl;
    }
}
```

```
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```

```
void pat2(int n){  
    for(int i=0;i<n;i++){  
        for(int j=0;j<=i;j++){  
            cout<<"*";  
        }  
        cout<<endl;  
    }  
}
```

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```
void pat3(int n){  
    for(int i=1;i<=n;i++){  
        for(int j=1;j<=i;j++){  
            cout<<j;  
        }  
        cout<<endl;  
    }  
}
```

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1

12

123

1234

12345

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```
void pat4(int n){  
    for(int i=1;i<=n;i++){  
        for(int j=1;j<=i;j++){  
            cout<<i;  
        }  
        cout<<endl;  
    }  
}
```

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1
22
333
4444
55555
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```
void pat5(int n){  
    for(int i=1;i<=n;i++){  
        for(int j=1;j<=n-i+1;j++){  
            cout<<"*";  
        }  
        cout<<endl;  
    }  
}
```

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```

void pat6(int n){
    for(int i=1;i<=n;i++){
        for(int j=1;j<=n-i+1;j++){
            cout<<j;
        }
        cout<<endl;
    }
}

```

```

void pat7(int n){
    for(int i=1;i<=n;i++){
        //space
        for(int j=1;j<=n-i;j++){
            cout<<" ";
        }
        //star
        for(int j=1;j<=2*i-1;j++){
            cout<<"*";
        }
        //space
        for(int j=1;j<=n-i;j++){
            cout<<" ";
        }
        cout<<endl;
    }
}

```

```

12345
1234
123
12
1

```

```

    *
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```

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```

void pat8(int n){
    for(int i=1;i<=n;i++){
        //space
        for(int j=1;j<=i-1;j++){
            cout<<" ";
        }
        //star
        for(int j=1;j<=2*n-2*i+2-1;j++){
            cout<<"*";
        }
        //space
        for(int j=1;j<=i-1;j++){
            cout<<" ";
        }
        cout<<endl;
    }
}

```

```

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```

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```

void pat9(int n){
    for(int i=1;i<=n;i++){
        //space
        for(int j=1;j<=n-i;j++){
            cout<<" ";
        }
        //star
        for(int j=1;j<=2*i-1;j++){
            cout<<"*";
        }
        //space
        for(int j=1;j<=n-i;j++){
            cout<<" ";
        }
        cout<<endl;
    }
    for(int i=1;i<=n;i++){
        //space
        for(int j=1;j<=i-1;j++){
            cout<<" ";
        }
        //star
        for(int j=1;j<=2*n-2*i+2-1;j++){
            cout<<"*";
        }
        //space
        for(int j=1;j<=i-1;j++){
            cout<<" ";
        }
        cout<<endl;
    }
}

```

```

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```

```

void pat10(int n){
    int k=1;
    for(int i=1;i<=2*n-1;i++){
        if(i<=n){
            for(int j=1;j<=i;j++){
                cout<<"*";
            }
        }else{
            for(int j=i-2*k;j>=1;j--){
                cout<<"*";
            }k++;
        }
        cout<<endl;
    }
}

```

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```

void pat11(int n){
    for(int i=1;i<=n;i++){
        for(int j=1;j<=i;j++){
            if((i+j)%2!=0){
                cout<<"0";
            }else{
                cout<<"1";
            }
        }
        cout<<endl;
    }
}

```

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1
01
101
0101
10101
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```

void pat12(int n){
    for(int i=1;i<=n-1;i++){
        //print
        for(int j=1;j<=i;j++){
            cout<<j;
        }
        //space
        for(int j=1;j<=2*n-2*i-2;j++){
            cout<<" ";
        }
        //star
        for(int j=i;j>=1;j--){
            cout<<j;
        }
        cout<<endl;
    }
}

```

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```

1      1
12     21
123   321
12344321
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```

```

void pat13(int n){
    int cnt=1;
    for(int i=1;i<=n;i++){
        for(int j=1;j<=i;j++){
            cout<<cnt;
            cnt++;
        }
        cout<<endl;
    }
}

void pat14(int n){
    for(int i=0;i<n;i++){
        for(char j='A';j<='A'+i;j++){
            cout<<j;
        }
        cout<<endl;
    }
}

void pat15(int n){
    for(int i=0;i<n;i++){
        for(char j='A'+n-i;j>='A';j--){
            cout<<j;
        }
        cout<<endl;
    }
}

```

```

1
23
456
78910
1112131415
A
AB
ABC
ABCD
ABCDE
FEDCBA
EDCBA
DCBA
CBA
BA
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```

```

void pat15point1(int n){
    for(int i=0;i<n;i++){
        for(char j='A';j<='A'+n-i-1;j++){
            cout<<j;
        }
        cout<<endl;
    }
}

void pat16(int n){
    for(int i=0;i<n;i++){
        for(char j='A';j<='A'+i;j++){
            cout<<char(i+'A');
        }
        cout<<endl;
    }
}

void pat17(int n){
    for(int i=0;i<n;i++){
        for(int j=0;j<n-i-1;j++){
            cout<<" ";
        }
        char ch = 'A';
        int breakpoint = (2*i+1)/2;
        for(int j=1;j<=2*i+1;j++){

            cout<<ch;
            if(j <= breakpoint) ch++;
            else ch--;
        }
        for(int j=0;j<n-i-1;j++){
            cout<<" ";
        }
        cout<<endl;
    }
}

```

ABCDE
 ABCD
 ABC
 AB
 A
 A
 BB
 CCC
 DDDD
 EEEEE

A
 ABA
 ABCBA
 ABCDCBA
 ABCDEDCBA
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```
void pat18(int n){  
    for(int i=0;i<n;i++){  
        for(char ch = ('A'+n-1)-i;ch<=('A'+n-1)-i;ch++){  
            cout<<ch<<" ";  
        }  
        cout<<endl;  
    }  
}
```

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E
D E
C D E
B C D E
A B C D E
PS D:\ASTudy\A

```

void pat19(int n){
    for(int i=1;i<=n;i++){
        //print
        for(int j=1;j<=n-i+1;j++){
            cout<<"*";
        }
        //space
        for(int j=1;j<=2*i-2;j++){
            cout<<" ";
        }
        //print
        for(int j=1;j<=n-i+1;j++){
            cout<<"*";
        }
        cout<<endl;
    }

    //inverted
    for(int i=1;i<=n;i++){
        //print
        for(int j=1;j<=i;j++){
            cout<<"*";
        }
        //space
        for(int j=1;j<=2*n-2*i;j++){
            cout<<" ";
        }
        //print
        for(int j=1;j<=i;j++){
            cout<<"*";
        }
        cout<<endl;
    }
}

```

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```

void pat20(int n){
    for(int i=1;i<=n;i++){
        //print
        for(int j=1;j<=i;j++){
            cout<<"*";
        }
        //space
        for(int j=1;j<=2*n-2*i;j++){
            cout<<" ";
        }
        //print
        for(int j=1;j<=i;j++){
            cout<<"*";
        }
        cout<<endl;
    }
}

```

```

//inbvertd
for(int i=1;i<=n;i++){
    //print
    for(int j=1;j<=n-i;j++){
        cout<<"*";
    }
    //space
    for(int j=1;j<=2*i;j++){
        cout<<" ";
    }
    //print
    for(int j=1;j<=n-i;j++){
        cout<<"*";
    }
    cout<<endl;
}
}

```

```

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```

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```

void pat21(int n){
    for(int i=1;i<=n;i++){
        for(int j=1;j<=n;j++){
            if(i==1||j==1||i==n||j==n){
                cout<<"*";
            }else{
                cout<<" ";
            }
        }
        cout<<endl;
    }
}

void pat22(int n){
    for(int i=0;i<n*2-1;i++){
        for(int j=0;j<2*n-1;j++){
            int top = i;
            int bottom = j;
            int right = (2*n - 2) - j;
            int left = (2*n - 2) - i;
            cout<<(n- min(min(top,bottom), m
        )
        cout<<endl;
    }
}

```

* *

* *

* *

4 4 4 4 4 4 4

4 3 3 3 3 3 4

4 3 2 2 2 3 4

4 3 2 1 2 3 4

4 3 2 2 2 3 4

4 3 3 3 3 3 4

4 4 4 4 4 4 4

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01.cpp / main()

```
#include<iostream>
using namespace std;
int main()
{
    int n,i,j;
    cin>>n;
    for(i=1;i<=n;i++)
    {
        for(j=1;j<=n-i;j++)
        {
            cout<<" ";
        }
        for(j=1;j<=n;j++){
            cout<<"*";
        }
        cout<<endl;
    }
}
```



```
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5
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*****
*****
*****
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```

zig zag patter.cpp > ...

```
#include<iostream>
using namespace std;
int main()
{
    int i,j,n;

    for(i=1;i<=3;i++)
    {
        for(j=1;j<=9;j++)
        {
            if((i+j)%4==0 || (i==2)&&(j%4==
                cout<<"*";
            else
                cout<<" ";
        }
        cout<<endl;
    }
}
```

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