Introduction to C++

- **What is C++ programming language?**
- **Declare variables.**
- **Operations in C++.**
- **Conditions and loops in C++.**

1. C++ is a cross-platform language that can be used to create high-performance applications.

2. C++ was developed as an extension to the C language.

3. C++ is one of the world's most popular programming languages.

4. C++ can be found in today's operating systems, Graphical User Interfaces, and embedded systems.

5. C++ gives a clear structure to programs and allows code to be reused, lowering development costs.

1.How to print on screen with C++

cout<< "   " ;

```cpp
1 #include <iostream>
2 using namespace std;
3 int main (){
4    cout << "Welcome to Introduction Course";
5    return 0;
6 }
```

(<<) insertion operator

- Write C++ a program to print your name

What if I wanted to print multiple lines?

```
int main() {
cout<<"Welcome to SDK";
cout<<"My name is Ali";
cout<<"I'm a Software Engineer";

    return 0;
}
```

output →

```
Welcome to SDKMy name is AliI'm a Software Engineer> [
```

As you can see all lines are beside each other.
To solve this problem, we need a new line, we can create a new line in 2 ways:

```
3 int main() {
4   cout<<"Welcome to SDK"<<endl;
5   cout<<"My name is Ali\n";
6   cout<<"I'm a Software Engineer";
7
8     return 0;
9  }
```

output →

```
Welcome to SDK
My name is Ali
I'm a Software Engineer> 
```

As we saw in the last slide we used \n to print a new line, can we do other things using the backslash\ ?

2. Escape sequence

\n	New Line
\r	Carriage Return
\t	Tab (Horizontal)
\\	Backslash
\'	Single Quote
\"	Double Quote

\

backslash

```cpp
cout << "Welcome to c++ course\n";
cout << "13246578\t1324567\t132465\t" << endl;
cout << "Hello\rSDK" << endl;
cout << "Ali said:\"I can do it\"" << endl;
cout << "I\'m backslash\\";
```

output

```
Welcome to c++ course
13246578      1324567 132465
SDKlo
Ali said:"I can do it"
I'm backslash\>
```

What if I want to keep a code but I don't want to compile it? Or maybe I want to write a description for another person to understand my code later? Comments are the solution

3.Comments

```cpp
1 #include <iostream>
2 using namespace std;
3 int main() {
4
5   // int age;
6   /*
7   cout << "Enter your age:" << endl;
8   cin >> age;
9   cout << "Your age is " << age << endl;
10  */
11  return 0;
12 }
```

/

forward slash

Backslash

Forward Slash

If we want to store fruits we need a box, the same as data.

If we want to store data we need the appropriate box which we call it data type.

4.Data types

Type	Usage	Examples
int	integer numbers	0 420
double	floating-point numbers	3.14 -200.0
char	characters	'a' '@'
string	sequence of characters	"Hello World!" "Codecademy"
bool	truth values	true false

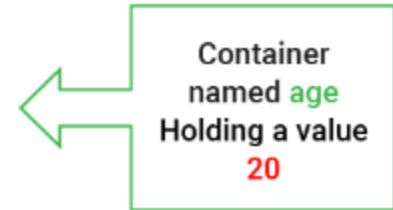How to create a variable in c++ with specific data type and value?
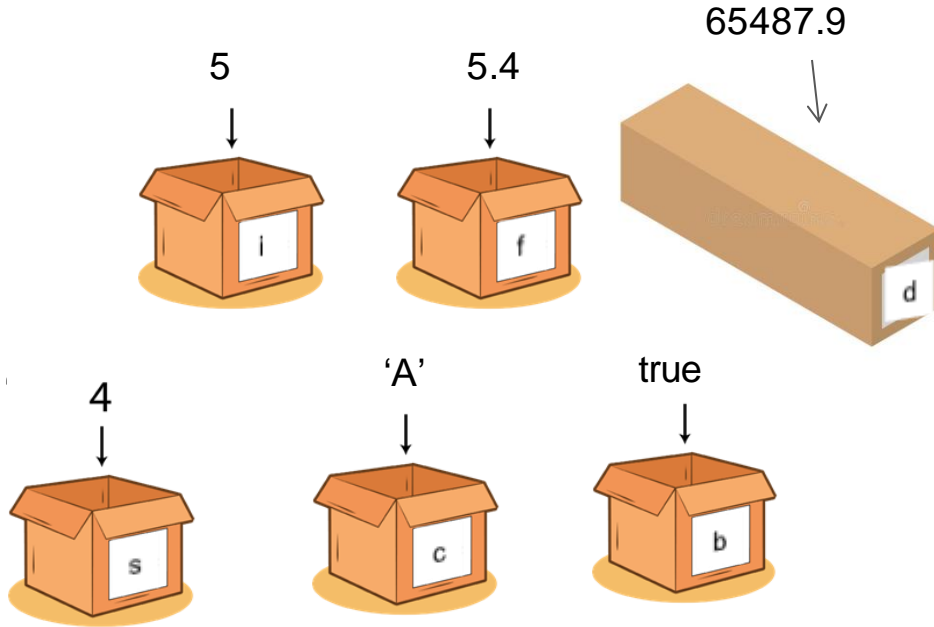
Declare variables

Declare variables

65487.9

5   5.4

4   'A'   true
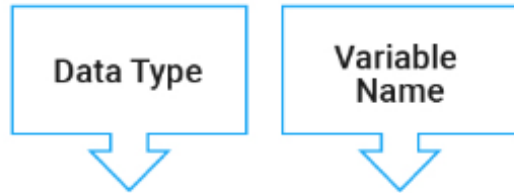
```cpp
1    #include <iostream>
2    using namespace std;
3 ▼  int main() {
4
5        int i = 5;
6        float f = 5.4;
7        double d = 65487.6;
8        string s = "Hello World";
9        char c = 'A';
10       bool b = true;
```

Just use it's name in cout statement:

```
12      cout << "Integer variable = " << i << endl;
13      cout << "Float variable = " << f << endl;
14      cout << "double variable = " << d << endl;
15      cout << "string variable = " << s << endl;
16      cout << "char variable = " << c << endl;
17      cout << "bool variable = " << b << endl;
18      return 0;
19  }
```

output

```
Output
Integer variable = 5
Float variable = 5.4
double variable = 65487.6
string variable = Hello World
char variable = A
bool variable = 1
>
```
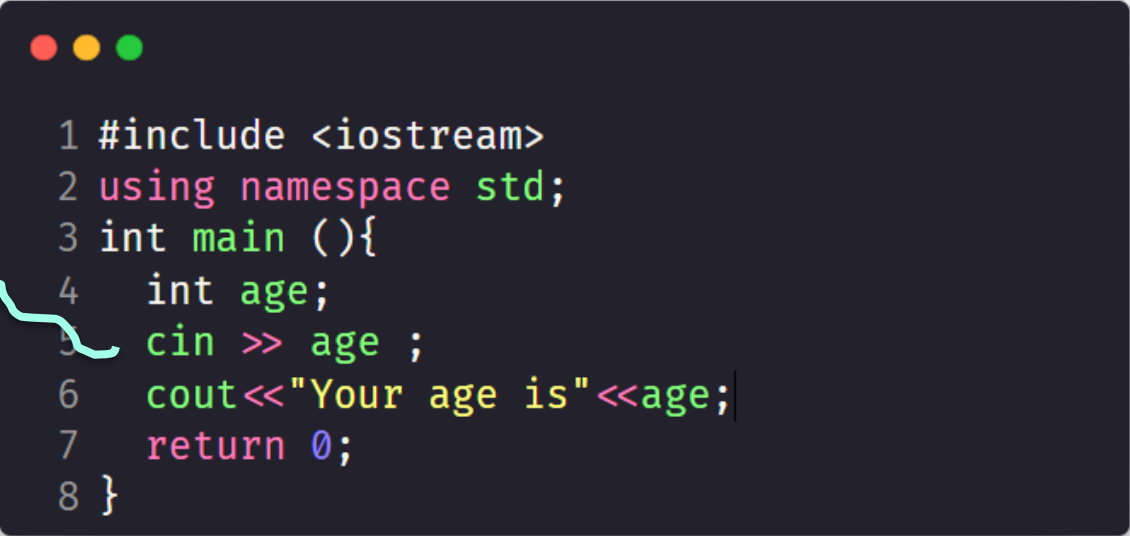
How to get data **from user**?

5.How to get input from user with C++

```
cin>>var ;
```

If you want to get data from the user you should prepare a place to store it, so after declaring a variable.
Use cin keyword and follow it with the variable name to store the input in it.
cin + >> + variable name;

```cpp
1 #include <iostream>
2 using namespace std;
3 int main (){
4     int age;
5     cin >> age ;
6     cout<<"Your age is"<<age;
7     return 0;
8 }
```

(>>)extraction operator

- Write C++ a program that ask user name and print it.

Can input multiple variable using one cin statement?

```cpp
int a ,b;
cout<<"Input 2 numbers:";
cin>>a>>b;
cout<<"Your input is a="<<a<<" b="<<b<<endl;
```

output

```
Input 2 numbers:5 6
Your input is a=5 b=6
```

Can I do math in c++?

Arithmetic operations

Operator	Meaning	Example
+	Addition	A + B
-	Subtraction	A − B
*	Multiplication	A * B
/	Division	A / B
^	Power	A^3
%	Reminder	A % B

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6.Operations

```cpp
#include <iostream>
using namespace std;
int main() {

    int a, b;
    cout << "Enter the first number:";
    cin >> a;
    cout << "Enter the second number:";
    cin >> b;

    cout << a << "+" << b << "=" << a + b << endl;
    cout << a << "-" << b << "=" << a - b << endl;
    cout << a << "*" << b << "=" << a * b << endl;
    cout << a << "/" << b << "=" << a / b << endl;
    cout << a << "%" << b << "=" << a % b << endl;

    return 0;
}
```

```
Enter the first number:15
Enter the second number:3
15+3=18
15-3=12
15*3=45
15/3=5
15%3=0
```

Operations

```cpp
#include <iostream>
using namespace std;
int main() {

  int a, b;
  cout << "Enter the first number:";
  cin >> a;
  cout << "Enter the second number:";
  cin >> b;

  cout << a << "+" << b << "=" << a + b << endl;
  cout << a << "-" << b << "=" << a - b << endl;
  cout << a << "*" << b << "=" << a * b << endl;
  cout << a << "/" << b << "=" << (a*1.0) / b << endl;
  cout << a << "%" << b << "=" << a % b << endl;

  return 0;
}
```

```
:/math
Enter the first number:17
Enter the second number:3
17+3=20
17-3=14
17*3=51
17/3=5.66667
17%3=2
```

Relational operator

Operator	Meaning	Example
<	Less than	A < B
<=	Less than or equal	A <= B
>	Greater than	A > B
>=	Greater than or equal	A >= B
= or ==	Equal	A == B
!= or #	Not equal	A != B

```cpp
int a,b;
cout<<"Input 2 numbers:\n";
cout<<"Enter the first number:";
cin>>a;
cout<<"Enter the second number:";
cin>>b;

cout<<a<<" > "<<b<<" reslut is  "<<(a > b)<<endl;
cout<<a<<" >= "<<b<<" reslut is  "<<(a >= b)<<endl;
cout<<a<<" < "<<b<<" reslut is  "<<(a < b)<<endl;
cout<<a<<" <= "<<b<<" reslut is  "<<(a <= b)<<endl;
cout<<a<<" == "<<b<<" reslut is  "<<(a == b)<<endl;
cout<<a<<" != "<<b<<" reslut is  "<<(a != b)<<endl;
```

```
./math
Input 2 numbers:
Enter the first number:6
Enter the second number:9
6 > 9 reslut is  0
6 >= 9 reslut is  0
6 < 9 reslut is  1
6 <= 9 reslut is  1
6 == 9 reslut is  0
6 != 9 reslut is  1
```

```
./math
Input 2 numbers:
Enter the first number:5
Enter the second number:5
5 > 5 reslut is  0
5 >= 5 reslut is  1
5 < 5 reslut is  0
5 <= 5 reslut is  1
5 == 5 reslut is  1
5 != 5 reslut is  0
```

```
./math
Input 2 numbers:
Enter the first number:9
Enter the second number:7
9 > 7 reslut is  1
9 >= 7 reslut is  1
9 < 7 reslut is  0
9 <= 7 reslut is  0
9 == 7 reslut is  0
9 != 7 reslut is  1
```

Logical operations

Operator	Meaning	Example
AND	A > B AND A < C	Result is true if both conditions true and false if one condition at least false the result is false
OR	A > B OR A < C	Result is true if both conditions true and false if one condition at least false the result is false
NOT	NOT (A >B)	Result true if the condition result false and vice versa

```cpp
bool a = true,b=false;

cout<<a<<" AND "<<b<<" reslut is  "<<(a and b)<<endl;
cout<<a<<" AND "<<b<<" reslut is  "<<(a && b)<<endl<<endl;

cout<<a<<" OR "<<b<<" reslut is  "<<(a or b)<<endl;
cout<<a<<" OR "<<b<<" reslut is  "<<(a || b)<<endl<<endl;

int num1=5,num2=6;
  cout<<"NOT "<<num1<<" > "<<num2<<" reslut is  "<<(not(num1 > num2))<<endl;
  cout<<"NOT "<<num1<<" > "<<num2<<" reslut is  "<<(!(num1 > num2))<<endl;
```

```
> ./math
1 AND 0 reslut is  0
1 AND 0 reslut is  0

1 OR 0 reslut is  1
1 OR 0 reslut is  1

NOT 5 > 6 reslut is  1
NOT 5 > 6 reslut is  1
>
```

Assignment Operators

Operator	Example	Equivalent Expression (m=15)	Result
+=	m +=10	m = m+10	25
-=	m -=10	m = m-10	5
*=	m *=10	m = m*10	150
/=	m /=	m = m/10	1
%=	m %=10	m = m%10	5

Introduction to programming

```
int a =5;
cout<<a+1<<endl;
cout<<a<<endl;
a +=1;
cout<<a<<endl;
```

6

5

6

To change the variable actual value we use assignment operators.

Solve the worksheet.

If Statements in c++

```
if (condition) {
    statement
    statement
    ...
}
```
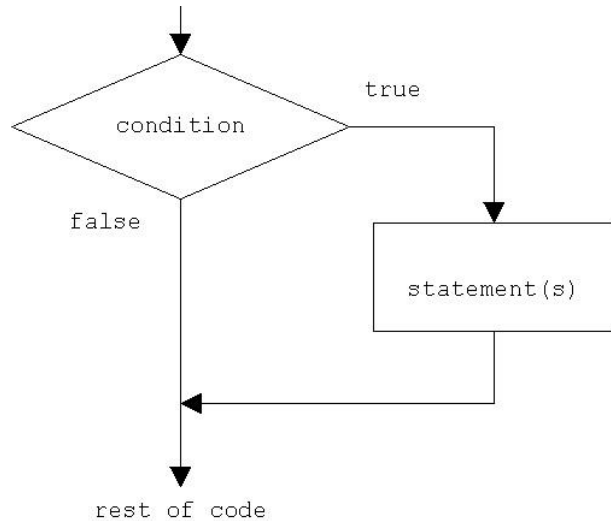
Condition

Any expression that evaluates to true or false

True branch

This is executed if the condition is true
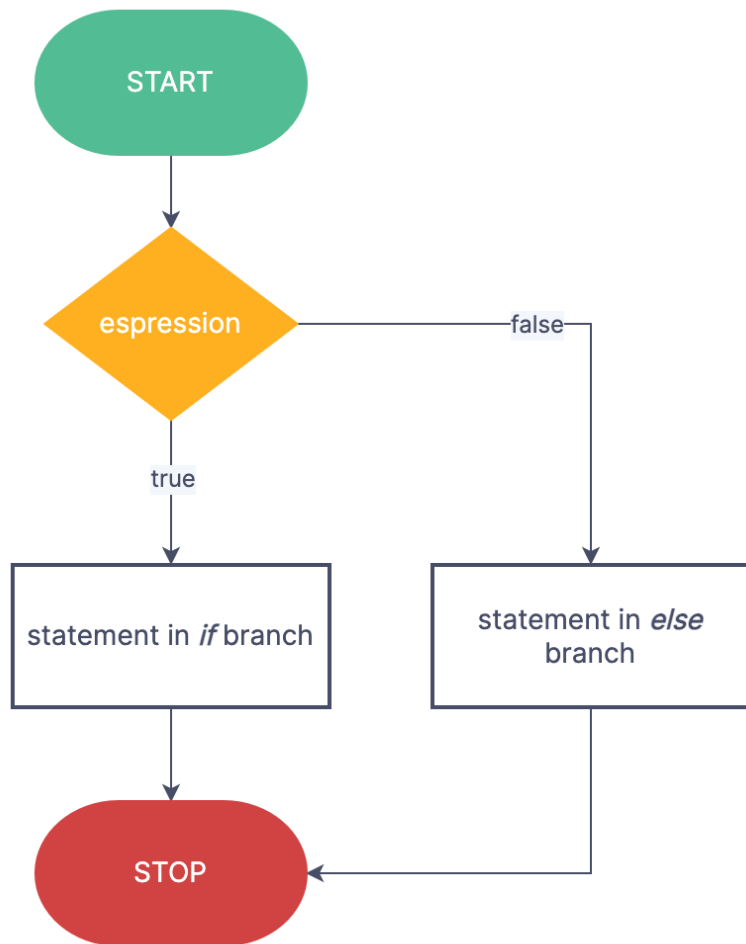
```
if ( condition ) {
  // code
}
else {
  // code
}


// code after if...else
```

Example

Ask the user to enter his mark.
Based on the mark of the student, calculate the grade using this range.
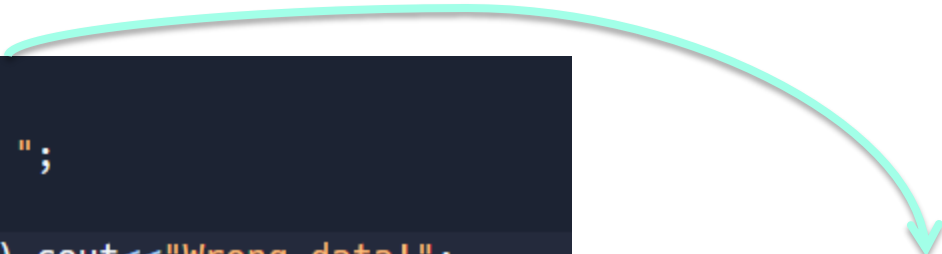
80 or above A grade
60 or above B grade
40 or above C grade
39 or less Fail

```cpp
 6      int mark;
 7    cout<<"Enter your mark ";
 8    cin>>mark;
 9      if (mark>100||mark<0) cout<<"Wrong data!";
10 ▼    else if(mark >= 80){
11      cout<<" You got A grade";
12        }
13 ▼    else if ( mark >=60){
14        cout<<" You got B grade";
15        }
16 ▼    else if ( mark >=40){
17        cout<<" You got C grade";
18        }
19 ▼    else if ( mark < 40){
20        cout<<" You Failed in this exam";
21        }
22
23
```

```
Enter your mark 45
 You got C grade:
```

```
> ./math
Enter your mark 78
 You got B grade:
```

```
> ./main
Enter your mark -98
Wrong data!:
```

Example

Write a c++ code to check weather a given integer is positive even, negative even, positive odd or negative odd .

```cpp
int main() {
  int num;
  cout << "Enter a number:";
  cin >> num;
  if (num < 0) {
    cout << "Number is Negative ";
  } else if (num > 0) {
    cout << "Number is Positive ";

  } else {
    cout << "Number is Zero\n";
  }
  if (num % 2 == 0 && num != 0)
    cout << "and Even" << endl;
  else if (num % 2 != 0 && num != 0)
    cout << "and Odd" << endl;
}
```

```
> ./math
Enter a number:-98
Number is Negative and Even
>
```
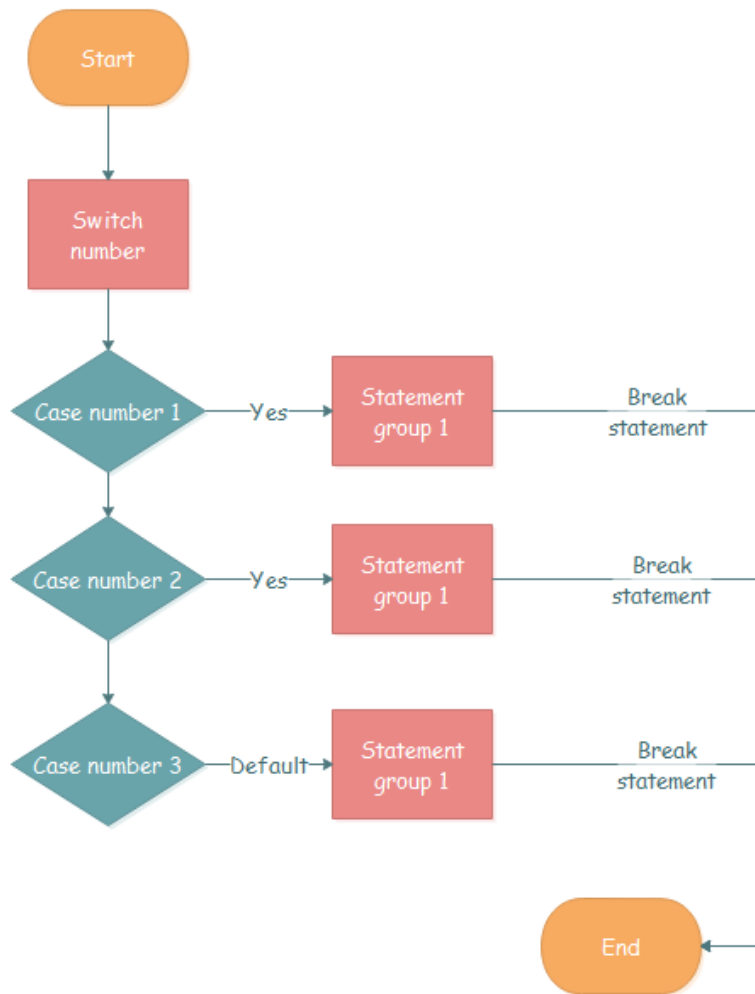
```
> ./main
Enter a number:65
Number is Positive and Odd
>
```

```
> ./math
Enter a number:0
Number is Zero
>
```

Solve the worksheet.

switch Statements in c++

```
switch( expression )
{
case value1:
//Block of code;
break;
case value2:
//Block of code;
break;
case valueN:
//Block of code
break;
default:
//Block of code
break;
```

Example

Teach Sara (7 years old) the days of week,
She will give you a number and your code will give her the day:
Sara: 2
Your code : Monday

```cpp
int main() {
  int num;
  string day;
  cout << "Hello Sara, Enter a number:";
  cin >> num;
  switch (num) {
  case 1:
    day = "Sunday";
    break;
  case 2:
    day = "Monday";
    break;
  case 3:
    day = "Tuesday";
    break;
  case 4:
    day = "Wednesday";
    break;
  case 5:
    day = "Thursday";
    break;
  case 6:
    day = "Friday";
    break;
  case 7:
    day = "Saturday";
  default:
    day = "Wrong input, try again";
  }
  cout << day << endl;
```

```
> ./main
Hello Sara, Enter a number:5
Thursday
> 
```

Solve the worksheet.
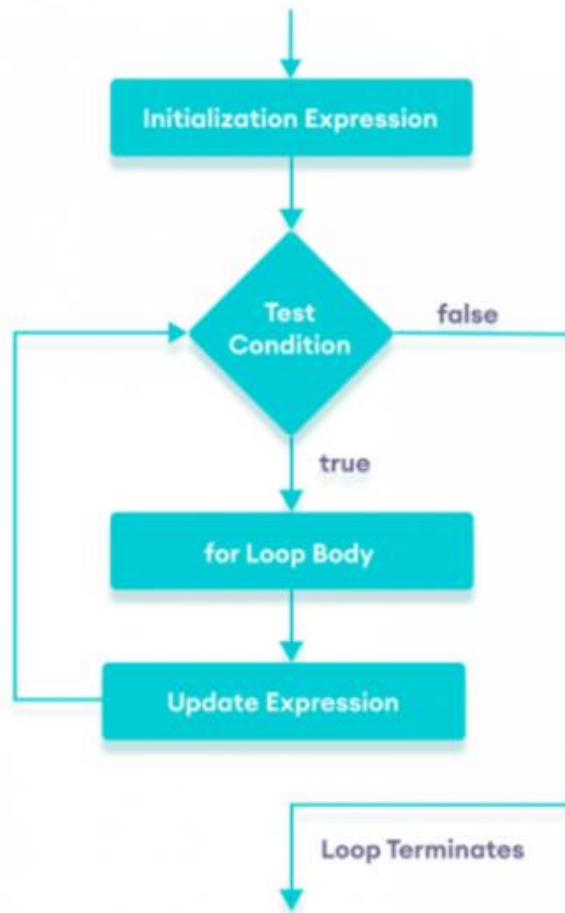
Loop in c++

VS
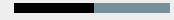
no loop

```
 1 #include<iostream>
 2   using namespace std;
 3
 4 int main(){
 5   cout<<"My name is Miral"<<endl;
 6   cout<<"My name is Miral"<<endl;
 7   cout<<"My name is Miral"<<endl;
 8   cout<<"My name is Miral"<<endl;
 9   cout<<"My name is Miral"<<endl;
10   cout<<"My name is Miral"<<endl;
11   cout<<"My name is Miral"<<endl;
12   cout<<"My name is Miral"<<endl;
13   cout<<"My name is Miral"<<endl;
14   cout<<"My name is Miral"<<endl;
15   cout<<"My name is Miral"<<endl;
16   cout<<"My name is Miral"<<endl;
17   cout<<"My name is Miral"<<endl;
18   cout<<"My name is Miral"<<endl;
19   cout<<"My name is Miral"<<endl;
20   return 0;
21 }
```

loop

```
1 #include<iostream>
2   using namespace std;
3
4 int main(){
5     for(int i=1;i<=15;i++)
6   cout<<"My name is Miral"<<endl;
7
8   return 0;
9 }
```

for loop:

```
1 for(initialization; condition; update )
2 {
3   //body
4 }
```

Initialization Expression

Test Condition

false

true

for Loop Body

Update Expression

Loop Terminates

Example

Write a C++ Program to Generate Multiplication Table.
input = 2
  output :
1*2=2
2*2=4...
12*2=24

while loop:

Test Condition

false

true

while loop body

Loop Terminates
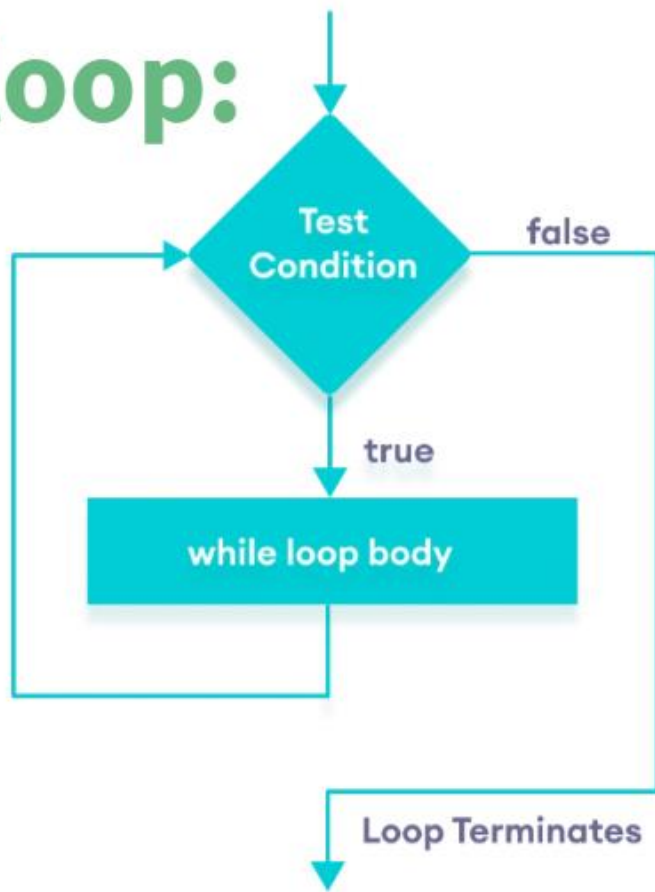
```
1 while (/*condition*/) {
2     //implementation
3 }
```
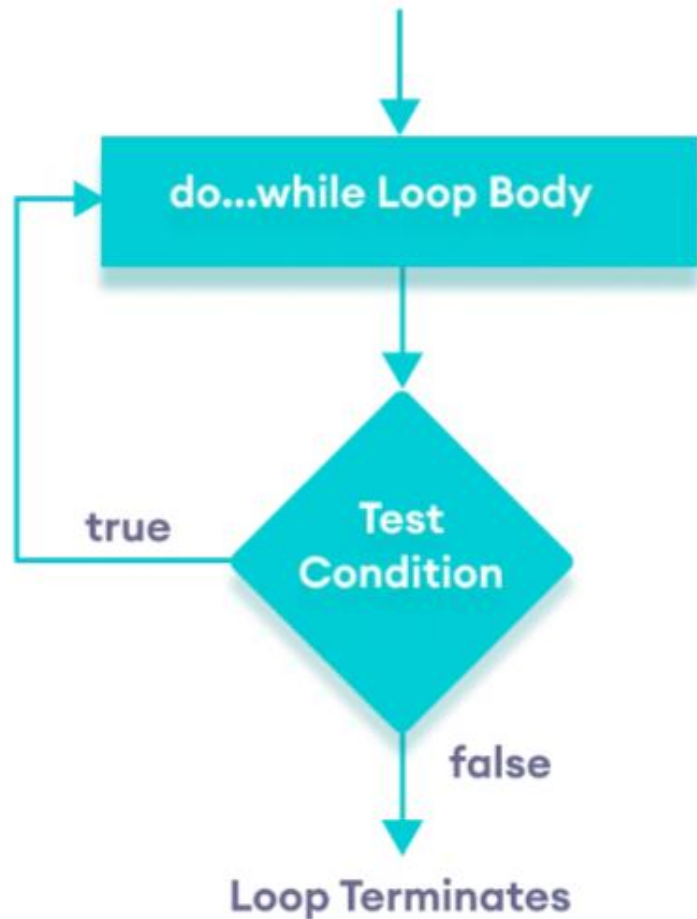
Example

Write a C++ Program to sum all numbers between 2 numbers given by the user.
input = 5 7
output :   Sum = 18

do while loop:

```
1 do {
2     //implementation
3 }while (/*condition*/) ;
```


do...while Loop Body

true

Test Condition

false

Loop Terminates

Example

Write a C++ program to let the user guess a number from 0 -10.
if the answer is wrong get new input.

```
while(false){
 cout<<"INSIDE WHILE\n";
 }
cout<<"OUTSIDE WHILE\n";
```

While VS do while

```
do{
 cout<<"INSIDE DO WHILE\n";
}while(false) ;
 cout<<"OUTSIDE DO WHILE\n";
```

Nested loop

```
1 for ( init; condition; increment ) {
2    for ( init; condition; increment ) {
3       inner loop body
4    }
5    outer loop body
6 }
```

```
1 while(condition) {
2    while(condition) {
3       inner while loop body
4    }
5          outer while loop body
6 }
```

```
1 do {
2       outer while loop body
3    do {
4      inner while loop body
5    } while( condition );
6
7 } while( condition );
```

Example

Write a c++ program to draw this pattern.

```
*
**
***
****
*****
******
*******
```

Break and Continue

```
1  for (int i = 0; i < 10; i++)
2  {
3    if (i == 4)
4    {
5      break;
6    }
7    cout << i << "\n";
8  }
```

```
1  for (int i = 0; i < 10; i++) {
2    if (i == 4) {
3      continue;
4    }
5    cout << i << "\n";
6  }
```

Suppose that the input is 4 7 –8 5 2
What is the value of following C++ code?

```cpp
1 int sum = 0, num, j;
2 for(j = 1; j <= 5; j++){
3 cin>>num;
4 if(num < 0)
5  break;
6 sum = sum + num;
7 }
8 cout<<sum<<endl;
```

What is the output of the following code?

```cpp
1 int x = 2;
2 do{
3 x += 2;
4 if(x % 3 == 0 && x % 2 == 0)
5 continue;
6 cout<<x<<" ";
7 }while(x % 8 != 0);
```

What is a and I values after execute this code?

```
2.      int main()
3.      {
4.          int a = 0, i = 0, b;
5.          for (i = 0;i < 5; i++)
6.          {
7.              a++;
8.              if (i == 3)
9.                  break;
10.         }
11.     }
```

What is the output ?

```
2.      void main()
3.      {
4.          int i = 0;
5.          int j = 0;
6.          for (i = 0;i < 5; i++)
7.          {
8.              for (j = 0;j < 4; j++)
9.              {
10.                 if (i > 1)
11.                     continue;
12.                     printf("Hi \n");
13.             }
14.         }
15.     }
```