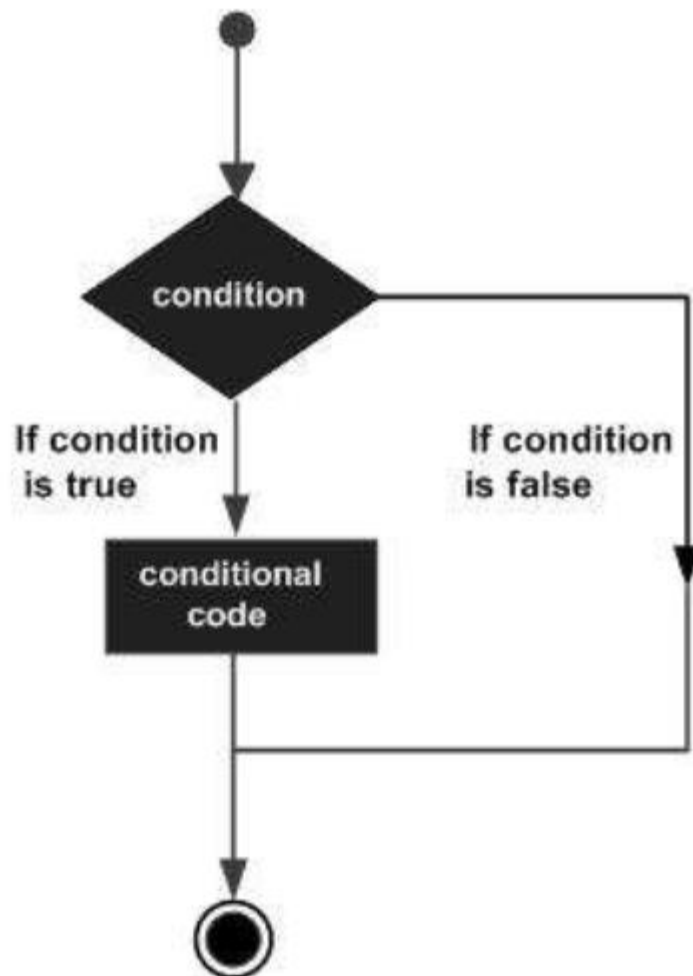


6. DECISION-MAKING STATEMENTS

Decision making structures require that the programmer specify one or more conditions to be evaluated or tested by the program, along with a statement or statements to be executed if the condition is determined to be true, and optionally, other statements to be executed if the condition is determined to be false.

Following is the general form of a typical decision making structure found in most of the programming languages:



C++ programming language provides following types of decision making statements.

Statement	Description
if statement	An 'if' statement consists of a boolean expression followed by one or more statements.
if...else statement	An 'if' statement can be followed by an optional 'else' statement, which executes when the boolean expression is false.
switch statement	A 'switch' statement allows a variable to be tested

6.1 If Statement

if statement consists of a boolean expression followed by one or more statements.

Syntax

The syntax of an if statement in C++ is:

```
if(boolean_expression)
{
    // statement(s) will execute if the boolean expression is true
}
```

If the boolean expression evaluates to **true**, then the block of code inside the if statement will be executed. If boolean expression evaluates to **false**, then the first set of code after the end of the if statement (after the closing curly brace) will be executed.

Example 1:

Write C++ program to read a given integer value from keyboard and print the value if it is positive.

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

int main()
{
int a;

cout << "Input integer value a :";

cin >>a;

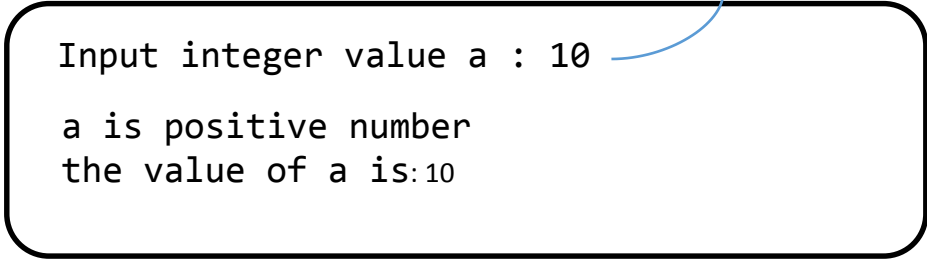
if (a>0)
    cout<<"a is positive number" << endl;

cout << "the value of a is :"<< a;

return 0;
}
```

The output for the above program is :

the input value



```
Input integer value a : 10
a is positive number
the value of a is:10
```

6.2 if...else Statement

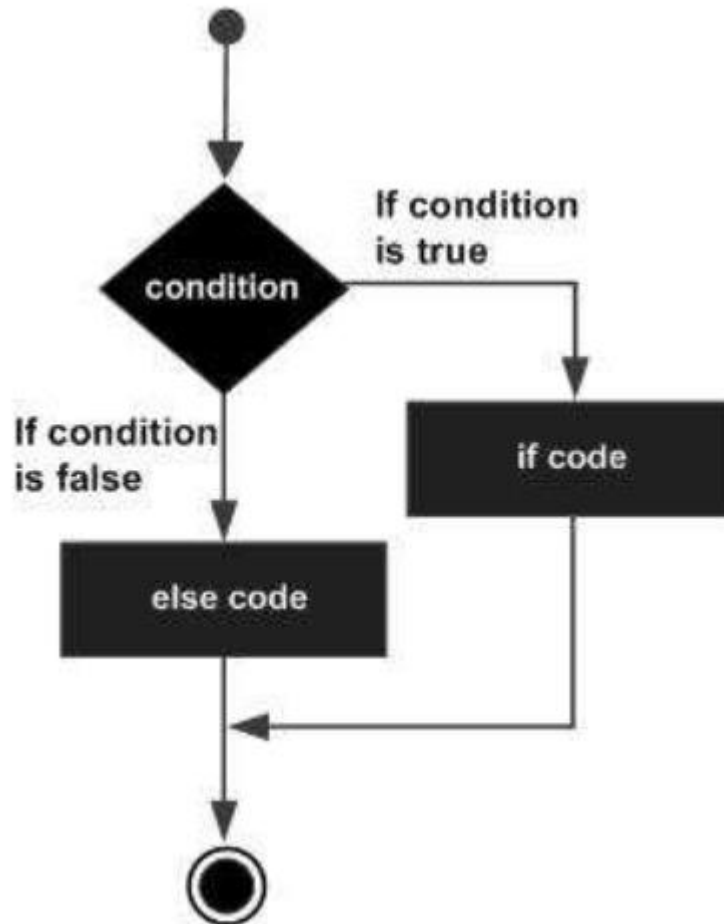
if statement can be followed by an optional **else** statement, which executes when the boolean expression is **false**.

Syntax

The syntax of an if...else statement in C++ is:

```
if(boolean_expression)
{
    // statement(s) will execute if the boolean expression is true
}
else
{
    // statement(s) will execute if the boolean expression is false
}
```

If the boolean expression evaluates to **true**, then the **if block** of code will be executed, otherwise **else block** of code will be executed.



Example 2:

Write C++ program to read a given integer value from keyboard and print the value if it is positive otherwise print it is negative

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

int main()
{
    int a;

    cout << "Input integer value a :";

    cin >>a;

    if (a>0)
        cout<<"a is positive number" << a;

    else
        cout <<"a is negative number"<< a;

    return 0;
}
```

Ex3 /Write C++ program to read a given integer value from keyboard and check if the value is even or odd .

```
#include <iostream>
using namespace std;
int main()
{
    int a;
    cout << "Input integer value a :";
    cin >>a;
    if (a % 2 == 0)
        cout<<"a is even number" << a;
    else
        cout <<"a is odd number"<< a;
    return 0;
}
```

Example 4:

Write C++ program to calculate Z value according to the following equations:

$$Z = \begin{cases} X + 10 & \text{if } X > 0 \\ 2X + 50 & \text{if } X < 0 \end{cases}$$

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

int main()
{
int X, Z;
cout << "Input integer value X :";

cin >>X;

if (X > 0)
{
    Z=X+10;
    cout<<" Z value is:" << Z;
}
else
{
    Z= 2*X+50;
    cout <<"Z value is :"<< Z;
}
return 0;
}
```

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او رقم؟

Q 5: //write a program to enter a character and determine the character is digit,small or capital letter?

```
#include <iostream>
using namespace std;
int main()
{ char letter;
  cout<<"Enter a letter:";
  cin >> letter;

  if(letter >= '0' && letter <= '9') cout<<"entered a digit.";
  else
  if(letter >= 'a' && letter <= 'z') cout<<"entered a small letter.";
  else
  if(letter >= 'A' && letter <= 'Z') cout<<"entered a capital letter.";
  else
  cout<<"You entered a special letter.";
  return 0;
}
```

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Q 6://write program to simulation a simple hand Calculator work?

```
#include<iostream>
using namespace std;
int main()
{
  int x,y; char sign;
  cin>>x >>sign >>y;
  if (sign== '+')
```

```

    cout<<x + y;
else if (sign == '-')
    cout<< x - y;
else if (sign == '*')
    cout<< x * y;
else if (sign == '/')
    cout<< x / y;
else
cout << "ERROR" ;
return 0;
}

```

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EX 7:

```

#include<iostream>
using namespace std;
int main()
{ int d; cout<<"Enter Number (1-7): "; cin>>d;
  if (d==1) cout<<"Sun.";
  else if (d==2) cout<<"Mun.";
  else if (d==3) cout<<"Tues.";
  else if (d==4) cout<<"Wen.";
  else if (d==5) cout<<"Thri.";
  else if (d==6) cout<<"Fri.";
  else if (d==7) cout<<"Sat.";
  else cout<<"number out of range!!!";
return 0;
}

```

6.3 The Switch Statement :

The switch statement provides a way of choosing between a set of alternatives, based on the value of an expression. The general form of the switch statement is:

```
switch (expression) {
case constant 1: statements;
...
...
case constant n: statements;
default: statements;
}
```

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EX 8// Write Program (W.P.) to read number between (1-7) and print name of day?

```
#include<iostream>
using namespace std;
int main()
{ int d;
cout<<"Enter Number (1-7): "; cin>>d;
switch (d)
{
case 1: cout<<"Sun."; break;
case 2: cout<<"Mun."; break;
case 3: cout<<"Tues."; break;
case 4: cout<<"Wen."; break;
case 5: cout<<"Thri."; break;
case 6: cout<<"Fri."; break;
case 7: cout<<"Sat."; break;
default: cout<<"number out of range!!!";
} return 0;
}
```

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**EX 9//write program to simulation a simple hand Calculator work?
(using switch)**

```

#include<iostream>
using namespace std;
int main()
{ float a,b; char sign;
cin>>a>>sign>>b;
switch (sign)
    {
    case '+': cout<<"="<<a+b <<endl ; break;
    case '-': cout<<"="<<a-b <<endl ; break;
    case '*': cout<<"="<<a*b <<endl ; break;
    case '/': cout<<"="<<a/b <<endl ; break;
    default:cout<<"ERROR";
    }
return 0;
}

```

and we can use nested switch statement!!

```

switch (expression1)
{
    case constant 1: switch (expression2)
        :
        :
    case constant n:

    default: statements;
}

```

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EX 10//Write Program (W.P.) to read first and second letter from names day starting and print name of day?

```

#include<iostream>
using namespace std;
int main()
{
char t1; char t2;

```

```

cout<<"Enter first charater: "; cin>>t1;
switch (t1)
{
    case 's': {cout<<"Enter second charater: ";
              cin>>t2;
              switch(t2)
              { case 'u': cout<<"Sun."; break;
                case 'a': cout<<"Sat."; break;
                default: cout<<"ERROR !!!"; break;
              }break; }
}

```

H.W. : Complete the previous program.

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EX 11////write a program to input 3 integers and determine which of them is biggest? (Second Method)

```

#include<iostream>
using namespace std;
int main()
{
    int x,y,z; int larg;
    cin>>x>>y>>z;
    larg=x;
    if (y>larg) larg=y;
    if (z>larg) larg=z;
    cout<<"larg No.="<<larg;
    return 0;
}

```

EX 12/find smallest No.?

```

#include<iostream>
using namespace std;

```

```

int main()
{
int x,y,z; int small;
cin>>x>>y>>z;
small=x;
if (y<small) small=y;
if (z<small) small=z;
cout<<small;
return 0;
}

```

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EX 13//Write Program (W.P.) to read first and second letter from names day starting and print name of day?

```

#include<iostream>
using namespace std;
int main()
{
char t1,t2;
cout<<"Enter first charater: "; cin>>t1;
switch (t1)
{
case 's': {cout<<"Enter second charater: ";
cin>>t2;
switch(t2)
{ case 'u': cout<<"Sun."; break;
case 'a': cout<<"Sat."; break;
default: cout<<"ERROR !!!"; break;
}break; }
case 'm': cout<<"Mun."; break;

```

```
case 't': {cout<<"Enter second charater: ";
cin>>t2;
        switch(t2)
        { case 'u': cout<<"Tues."; break;
          case 'h': cout<<"Thri."; break;
          default: cout<<"ERROR !!!";
            } break; }
case 'w': cout<<"wen."; break;
case 'f': cout<<"Fri."; break;
default: cout<<"ERROR!!!";
}
return 0; }
```

EX 14:

```
#include<iostream>
using namespace std;
int main()
{ int m;
cout<<"enter No. month: "; cin>>m;
switch (m){
case 1:
case 3:
case 5:
case 7:
case 8:
case 10:
case 12: cout<<"31 days"; break;
case 2:cout<<"28 days"; break;
case 4:
case 6:
case 9:
case 11: cout<<"30 days"; break;
default:cout<<"No. out of range 1_12";
```

```
} return 0; }
```

Home work :Enter month Number from (1-12) then display count month days?

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EX 15// Write Program (W.P.) to find Y value , when

$$Y = \sqrt{X^2 + Z^2}$$

```
#include<iostream>
#include<math.h>
using namespace std;
int main()
{
int x,z; double y;
cout<<"Enter x value: "; cin>>x;
cout<<"Enter z value: "; cin>>z;
    y=sqrt(x*x+z*z);
    cout<<"Y="<<y;
return 0;
}
```

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EX 16// Write Program (W.P.) to find Y value , when

$$Y = \sqrt{X^4} + 5 * X + 3 \quad \text{IF } x \text{ IS EVEN}$$

$$Y = \sqrt{X^3} + 2 * X + 5 \quad \text{IF } x \text{ IS ODD}$$

```
#include<iostream>
#include<math.h>
using namespace std;
```

```

int main()
{
int x; double y;
cin>>x;
if (x%2==0)
    y=sqrt(pow(x,4)+5*x+3);
    else
    y=sqrt(pow(x,3)+2*x+5);
cout<<"Y="<<y;
return 0;}

```

EX 17//what is the output of this program:

```

#include<iostream>
using namespace std;
int main()
{
int x,y,z;
x=y=z=0;
x=++y + ++z;
cout<<x<<y<<z<<endl;
x=y++ + z++;
cout<<x<<y<<z<<endl;
x=++y + z++;
cout<<x<<y<<z<<endl;
x=y-- + --z;
cout<<x<<y<<z<<endl;
return 0;
}

```

Output screen

211

222

533

522