

If it rains today,  
condition

I will stay home,  
decision.

## if Statement

If statement is used to implement decision. When a condition is fulfilled, one set of statements is executed.

Syntax

```
if (Boolean_Expression)
{
    statements
}
```

condition

Decision.

$(9.0 > 2.0) \rightarrow \text{True}$

```
if (grade >= 60)
{
    cout << "This student passed";
}
```

→ Write a program to check a given grade. If the grade value is greater than or equal to 60, program prints "This student passed" on the console window.

→ #include <iostream>

→ using namespace std;

→ int main()

```
{
    int grade = 82;
    if (grade >= 60)
    {
        cout << "This student passed ";
    }
}
```

grade

82

TRUE

if (82 >= 60)

→ return 0;

}

OUTPUT

This student passed.

**Practice Problem 1:** Consider the following if statement to compute the discounted price. What is the discounted price if the original price is 90.

```
int originalPrice = 90, discountedPrice;  
discountedPrice = originalPrice;
```

originalPrice ~~90~~  

90

```
if ( originalPrice > 100 )
```

90 > 100

discountedPrice

```
{  
X discountedPrice = originalPrice - 10 ;  
}
```

90

discounted price = 90.

**Practice Problem 2:** Consider the following if statement to compute the discounted price. What is the discounted price if the original price is 100.

```
int originalPrice = 10090, discountedPrice;  
→ discountedPrice = originalPrice;
```

originalPrice ~~90~~  

100

```
if ( originalPrice > 100 )
```

False

100 > 100

discountedPrice

```
{  
X discountedPrice = originalPrice - 10 ;  
}
```

100

discounted price = 100

## if-else Statement

If statement is used to implement decision. When a condition is fulfilled, one set of statements is executed. Otherwise, another set of statements is executed.

syntax

```
if (Boolean_Expression)
{ statements1 }
else
{ statements2 }
```

- \* Write a program to check a given grade. If the grade value is greater than or equal to 60, program prints "This student passed" on the console window. Otherwise, program prints "This student failed" on the console window.

```
#include <iostream>
```

```
using namespace std;
```

```
int main()
{
```

```
    int grade = 52;
```

```
    if (grade >= 60)
```

```
    {
```

```
        cout<<"This student passed ";
```

```
    }
```

```
    else
```

```
    {
```

```
        cout<<"This student failed";
```

```
    }
```

```
    return 0;
```

```
}
```

grade

52.

False.

52 >= 60

OUTPUT

This student failed.



**Practice Problem 1.** Consider the following if statement to compute the discounted price. What is the discounted price if the original price is 95.

```

int originalPrice = 95, discountedPrice;
if ( originalPrice > 100 )
    { discountedPrice = originalPrice - 20 ; }
else
    { discountedPrice = originalPrice - 10 ; }
        
```

originalPrice

95

discountedPrice

$95 > 100 \leftarrow \text{False.}$

$95 - 10 = 85$

discounted Price = 85 ?

**Practice Problem 2.** Consider the following if statement to compute the discounted price. What is the discounted price if the original price is 100.

```

int originalPrice = 10095, discountedPrice;
if ( originalPrice > 100 )
    { discountedPrice = originalPrice - 20 ; }
else
    { discountedPrice = originalPrice - 10 ; }
        
```

False.

$(100 > 100)$

$= 100 - 10 ; = 90$

discounted price = 90.

if (a == b) → c++  
a = b → Math

## Comparison Operators

	C++	Math Notations	Descriptions
same	>	>	Greater than ✓
	>=	≥	Greater than or equal
same	<	<	Less than
	<=	≤	Less than or equal
==	=	=	Equal
	!=	≠	Not equal

## while loop

While loop executes block of code/statement repeatedly until a specific goal is attained. The repetition will continue as long as the condition remains true.

Syntax

```
while (condition)
{
    statements
}
```

Boolean expression

Example

```
counter = 1 ;
While (counter <= 100)
{
    sum = sum + counter ;
    counter ++ ;
}
```

condition

statement

++ → increment operator  
 -- → Decrement operator

A program to calculate summation of first 3 numbers:  $1+2+3=?$

sum  
 0  
 1  
 3  
 6

counter  
 1  
 2  
 3  
 4

int i=10;  
 i++;

i++ or i=i+1;

$$1+2+3=6$$

→ #include <iostream>

→ using namespace std;

→ int main()

```
{
    int sum = 0;
    int counter = 1;
    while (counter <= 3)
    {
        sum = sum + counter;
        counter++;
    }
    cout << "The summation of 1+2+3 is:" << sum << endl;
    return 0;
}
```

1 <= 3 → True  
 2 <= 3 → True  
 3 <= 3 → True  
 4 <= 3 → False

sum = 0 + 1 = 1  
 sum = 1 + 2 = 3  
 sum = 3 + 3 = 6

OUTPUT

The summation of 1+2+3 is: 6

```
int i = 10;
i--;
i = i - 1;
10 - 1 = 9
```

10  
 9

### while loop Example 1

What is the output of following program (when embedded in a complete program?)

```
int i = 0; ←
int sum = 0; ←
while (sum < 3)
{
    i++;
    sum = sum + i;
    cout << i << " " << sum << endl;
}
```

$0 < 3 \rightarrow \text{True}$   
 $1 < 3 \rightarrow \text{True}$   
 $3 < 3 \rightarrow \text{False}$

i	sum
0	0
1	1
2	3

$\rightarrow \text{sum} = 0 + 1 = 1$   
 $\rightarrow \text{sum} = 1 + 2 = 3$

OUTPUT

1	1
2	3

What is the output of following program (when embedded in a complete program?)

```
i = 0; ←
sum = 0;
while (sum < 0)
{
    i++;
    sum = sum + i;
    cout << i << " " << sum;
}
```

$0 < 0 \rightarrow \text{False}$

i	sum
0	0

$\rightarrow$

OUTPUT.

--	--



# Homework No. 6

$$\frac{10}{100} = 0.1$$

$$ICA = 1.E^6 \times 0.1 = 1E^5$$

$$IC_B = 1E^6 \times 0.2 = 2E^5$$

$$IC_C = 1E^6 \times 0.5 = 5E^5$$

$$IC_D = 1E^6 \times 0.2 = 2E^5$$

Q. P1

$$\text{clock Rate} = 2.5 \text{ GHz}$$

P2

$$\text{clock Rate} = 3.0 \text{ GHz}$$

CPU clock cycles

$$= (1E^5 \times 1) + (2E^5 \times 2) + (5E^5 \times 3) + (3 \times 2E^5)$$
$$= 2.8 E^6$$

Q

$$\text{Average CPI} = \frac{\text{CPU clock cycles}}{\text{Instruction count}}$$

$$\text{CPU Time} = \frac{\text{CPU clock cycles}}{\text{clock Rate} \star}$$