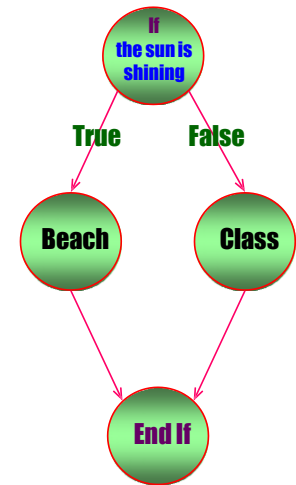


Programming in C++

Choice Statements

If Statements

```
if (the sun is shining)
    go to the beach;
else
    go to class;
```



2

Boolean Data Type (false, true)

i.e.

```
bool bFlag;  
bFlag = true;  
bFlag = 5 > 12;
```

```
bFlag  
true  
false
```

3

Boolean Data-Type

→ The type **bool** is also described as being an integer:

- ↘ false = 0
- ↘ true = 1

4

Boolean Operators

Binary Operators – Compare two values

Mathematics

=

≠

>

≥

<

≤

C++

==

!=

>

>=

<

<=

5

Logical Conditions (Or, And , Not)

OR

true || true = true

true || false = true

false || true = true

false || false = false

AND

true && true = true

true && false = false

false && true = false

false && false = false

NOT

! true = false

! false = true

6

Operators (Or , And , Not)

```
Age = 30;
10 < Age < 20    true
```

```
┌ true
└ 1
```

```
false = 0
true = 1
```

```
(10 < Age) && (Age < 20)    false
```

7

Exercises

Note:

- ✦ false = 0
- ✦ true = notzero

Exercises:

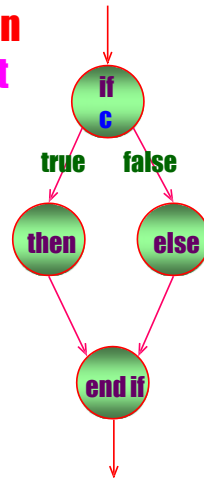
Statement	Output
cout << true false && false;	1
cout << (true false) && false;	0
cout << 12 && 0;	0
cout << (7 > 5);	1

8

Decision implementation

1) if-then-else statement

```
if (<Condition>
    <Statement>;
else
    <Statement>;
```



9

if-then-else Example

```
int Num1;
int Num2;

cin >> Num1 >> Num2;
if (Num1 > Num2)
    cout << Num1;
else
    cout << Num2;
```

Num1	Num2	Output
7	5	7
3	9	9
7	7	7

10

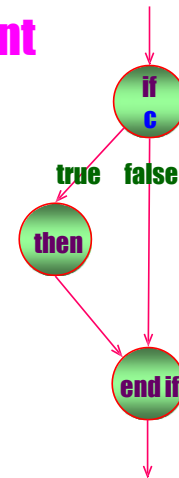
Another example

```
int grade;
cout << "Enter your grade: ";
cin >> grade;
if (grade >= 60)
    cout << "You passed";
else
    cout << "You failed";
```

11

2) if-then Statement

```
if (<Condition>)
    <Statement>;
```



12

if-then Example

```
int grade;
cout << "Enter your grade: ";
cin >> grade;
if (grade >= 60)
    cout << "You passed";
```

13

Compound Statements

```
int grade = 30;
if (grade >= 60)
{
    cout << "You passed" << endl;
    cout << "Congratulations";
}
```

```
int grade = 30;
if (grade >= 60)
    cout << "You passed" << endl;
    cout << "Congratulations";
```

Congratulations

17

Compound Statements

```
int grade;
cout << "Enter your Grade: ";
cin >> grade;
if (grade >= 60)
{
    cout << "You passed" << endl;
    cout << "Congratulations\n";
}
else
{
    cout << "You failed" << endl;
    cout << "SORRY\n";
}
```

Enter your grade: **82**
You passed
Congratulations

Enter your grade: **46**
You failed
SORRY

15

Error. Why?

```
int grade;
cout << "Enter your Grade: ";
cin >> grade;
if (grade >= 60)

    cout << "You passed" << endl;
    cout << "Congratulations\n";

else

    cout << "You failed" << endl;
    cout << "SORRY\n";
```

16

Correct but ...

```
int grade;
cout << "Enter your Grade: ";
cin >> grade;
if (grade >= 60)
{
    cout << "You passed" << endl;
    cout << "Congratulations\n";
}
else
    cout << "You failed" << endl;
    cout << "SORRY\n";
```

Enter your grade: 46
You failed
SORRY

Enter your grade: 82
You passed
Congratulations
SORRY

17

Nested if-Statements

```
int Num1, Num2;
cin >> Num1 >> Num2;
if (Num1 > Num2)
    if (Num1 + Num2 > 20)
        cout << Num1;
    else
        cout << Num2;
```

<u>Num1</u>	<u>Num2</u>	<u>Output</u>
5	10	
12	3	3
12	10	12

18

But check this example ?

```
int Num1, Num2;
cin >> Num1 >> Num2;
if (Num1 > Num2)
{
    if (Num1 + Num2 > 20)
        cout << Num1;
}
else
    cout << Num2;
```

<u>Num1</u>	<u>Num2</u>	<u>Output</u>
5	10	10
12	3	12
12	10	12

19

Example

```
int grade;
cout << "Enter your grade: ";
cin >> grade;
if (grade > 100 || grade < 0)
    cout << "Not a valid grade";
else {
    cout << "You got ";
    if (grade >= 90) cout << "an A";
    else if (grade >= 80) cout << "a B";
    else if (grade >= 70) cout << "a C";
    else if (grade >= 60) cout << "a D";
    else cout << "an F";
}
```

23

Programming Exercise

Enter three numbers: **8 12 -3**
Max = 12

24

Solution 1

```
int a, b, c;
```

Enter three numbers: **8 4 -3**
Max = 8

```
cout << "Enter three numbers: ";  
cin >> a >> b >> c;
```

```
if (a > b)  
{  
    if (a > c)  
        cout << "Max = " << a;  
    else  
        cout << "Max = " << c;  
}  
else  
{  
    if (b > c)  
        cout << "Max = " << b;  
    else  
        cout << "Max = " << c;  
}
```

22

Solution 2

```
Enter three numbers: -8 4 -3
Max = 4
```

```
int a, b, c, max;
cout << "Enter three numbers: ";
cin >> a >> b >> c;

if (a > b)
    max = a;
else
    max = b;

if (c > max)
    max = c;

cout << "Max = " << max;
```

23

Solution 3

```
Enter three numbers: 4 32 45
Max = 45
```

```
int a, b, c;
cout << "Enter three numbers: ";
cin >> a >> b >> c;

if (a >= b && a >= c)
    cout << "Max = " << a;
else if (b >= a && b >= c)
    cout << "Max = " << b;
else
    cout << "Max = " << c;
```

24

Programming Exercise

How old are you? **18**
You are a teenager

Age	
0-4	Baby
5-14	Child
15-19	Teenager
20-64	Adult
above 64	Old

25

Solution

How old are you? **32**
You are an adult

```
int Age;
cout << "How old are you? ";
cin >> Age;
cout << "You are ";
if (Age < 0)
    cout << "not born yet";
else if (Age < 5)
    cout << "a baby";
else if (Age < 15)
    cout << "a child";
else if (Age < 20)
    cout << "a teenager";
else if (Age < 65)
    cout << "an adult";
else
    cout << "old";
```

26

Exercise

Enter a digit: 3
Three

```
int Digit;
cout << "Enter a digit: ";
cin >> Digit;
if (Digit == 0)
    cout << "Zero";
else if (Digit == 1)
    cout << "One";
else if (Digit == 2)
    cout << "Two";
else if (Digit == 3)
    cout << "Three";
else if (Digit == 4)
    cout << "Four";
else if (Digit == 5)
    cout << "Five";
else if (Digit == 6)
    cout << "Six";
else if (Digit == 7)
    cout << "Seven";
else if (Digit == 8)
    cout << "Eight";
else if (Digit == 9)
    cout << "Nine";
else
    cout << "Not a digit";
```

What's wrong with this?

```
Day = 4;
if (Day = 0)
    cout << "Sunday";
else if (Day = 1)
    cout << "Monday";
else if (Day = 2)
    cout << "Tuesday";
else if (Day = 3)
    cout << "Wednesday";
else if (Day = 4)
    cout << "Thursday";
else if (Day = 5)
    cout << "Friday";
else if (Day = 6)
    cout << "Saturday";
```

Monday

```
if (Day == 0)
    cout << "Sunday";
```

same as

```
if (0 == Day)
    cout << "Sunday";
```

**but the following will
give a syntax error**

```
if (0 = Day)
    cout << "Sunday";
```

```
bool Flag;
if (Flag == true)
...

```

```
bool Flag;
if (Flag)
...

```

Same

Note:
false = 0
true ≠ 0

```
int num = 10
if (num)
...

```

true

```
if (true)
...

```

true

```
int num = 10
if (1)
...

```

true

```
if (3-2-1)
...

```

false

```
if (2.344)
...

```

true

29

Nesting

→ **The Condition is the most right**

```
if (x = Grade/100, x >= 0.6)
{
    cout << "You passed" << endl;
    cout << "Congratulations";
}
```

```
if (3, 5-1, 7, 8, 9+2)
    cout << "This is true";
if (3, 4-6, 5, 3-2-1)
    cout << "This is false";
```

Be Careful

```
Grade = 30;
if (Grade >= 60) ;
{
  cout << "You passed\n";
  cout << "Congratulations\n";
}
```

You passed
Congratulations

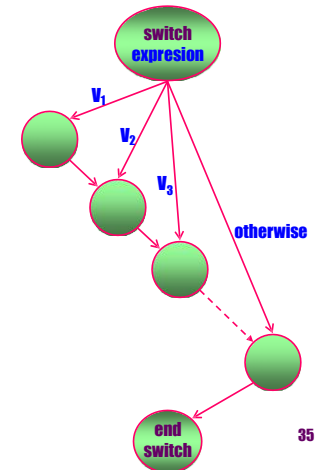
```
Grade = 74;
if (Grade >= 60)
{
  cout << "You passed" << endl;
  cout << "Congratulations\n";
}
else ;
{
  cout << "You failed\n";
  cout << "SORRY\n";
}
```

You passed
Congratulations
You failed
SORRY

31

Switch (Case) Statement

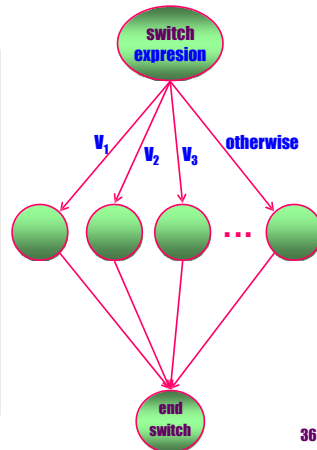
```
switch (<expression>) {
  case V1 : <Statements>;
  case V2 : <Statements>;
  case V3 : <Statements>;
  ...
  default : <Statements>;
}
```



35

Switch Statement with break

```
switch (<expression>) {
  case V1: <Statements>;
    break;
  case V2: <Statements>;
    break;
  case V3: <Statements>;
    break;
  ...
  default: <Statements>;
    break;
}
```



36

Break Statement

- The **break** statement causes execution to exit the switch statement. Otherwise, the flow of control “falls through” the next case.

```
switch (Grade)
{
  case 'A' :
  case 'B' :
  case 'C' :
  case 'D' :
    cout << "You passed"; break;
  case 'F' :
    cout << "You failed"; break;
  default :
    cout << "Invalid grade"; break;
}
```

37

Switch Statement Example

```
int Digit;
cout << "Enter a digit: ";
cin >> Digit;
switch (Digit) {
  case 0: cout << "Zero"; break;
  case 1: cout << "One"; break;
  case 2: cout << "Two"; break;
  case 3: cout << "Three"; break;
  case 4: cout << "Four"; break;
  case 5: cout << "Five"; break;
  case 6: cout << "Six"; break;
  case 7: cout << "Seven"; break;
  case 8: cout << "Eight"; break;
  case 9: cout << "Nine"; break;
  default: cout << "Not a digit"; break;
}
```

Enter a digit: **3**
Three

38

Programming Exercise

How old are you? **18**
You are a teenager

Age	
0-4	Baby
5-14	Child
15-19	Teenager
20-64	Adult
above 64	Old

39

Solution

```

int Age;
cout << "How old are you? ";
cin >> Age;
cout << "You are ";
if (Age < 0)
    cout << "not born yet";
else
    switch (Age / 5) {
        case 0 : cout << "a baby"; break;
        case 1 : cout << "a child"; break;
        case 2 : cout << "a teenager"; break;
        case 3 : cout << "a teenager"; break;
        case 4 :
        case 5 :
        case 6 :
        case 7 :
        case 8 :
        case 9 :
        case 10 :
        case 11 :
        case 12 : cout << "an adult"; break;
        default : cout << "old"; break;
    }

```

How old are you? 32
You are an adult

40

The Conditional Statement

- A shortcut to a simple if-then-else statement used normally to assign different values to a variable depending on a condition.

condition ? stment_if_true : stment_if_false

```

if(year%4 == 0) FebDays = 29;
else FebDays = 28;

```

same as

```
FebDays = year%4 == 0 ? 29 : 28;
```

same as

```
year%4 == 0 ? FebDays = 29 : FebDays = 28;
```

41