CS-114 - Fundamental of Programing

Lab Manual # 05

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Lab Manual # 05
Selection structures

Objective:

This lab is about the selection structure and understanding the types of selection structure.

Description:

Selection: decisions, branching; when there are 2 or more alternatives. There are three types of selection structure:

- if
- if...else
- switch

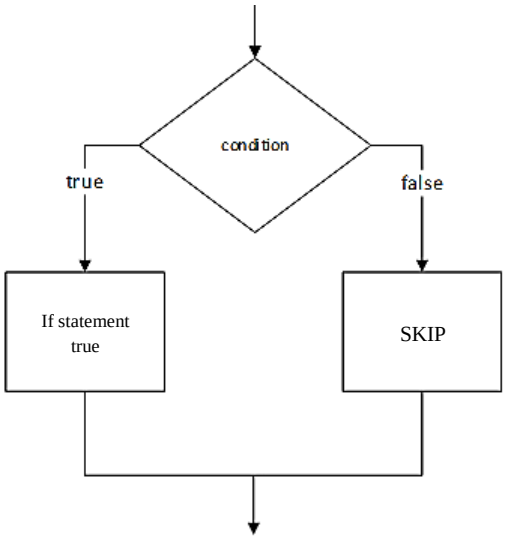
If Statement:

The syntax of the `if` statement is:

```
if (condition) {
   // body of if statement
}
```

The `if` statement evaluates the `condition` inside the parentheses `( )`.

- If the `condition` evaluates to `true`, the code inside the body of `if` is executed.
- If the `condition` evaluates to `false`, the code inside the body of `if` is skipped.



How if statement works:

Test expression is true

```
int test = 5;

if (test < 10)
{
  // codes
}

// codes after if
```

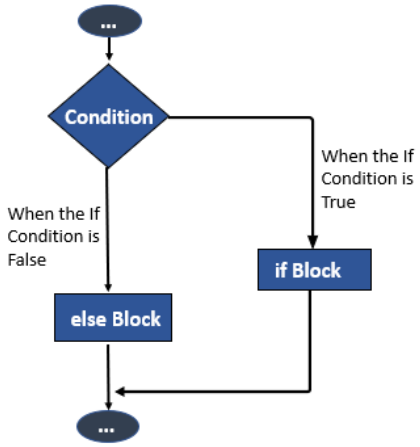
Test expression is false

```
int test = 5;

if (test > 10)
{
  // codes
}

// codes after if
```

If.. else statement:

- If condition returns true then the statements inside the body of "if" are executed and the statements inside body of "else" are skipped.
- If condition returns false then the statements inside the body of "if" are skipped and the statements in "else" are executed.

```
if(condition) {
   // Statements inside body of if
}
else {
   //Statements inside body of else
}
```



How If-else statement works:

Test expression is true

```
int test = 5;

if (test < 10)
{
  // codes
}
else
{
  // codes
}
// codes after if...else
```

Test expression is false

```
int test = 5;

if (test > 10)
{
  // codes
}
else
{
  // codes
}
// codes after if...else
```

If else-if Statement:

The **if...else** statement is used to execute a block of code among two alternatives. However, if we need to make a choice between more than two alternatives, we use the **if...else if...else** statement.

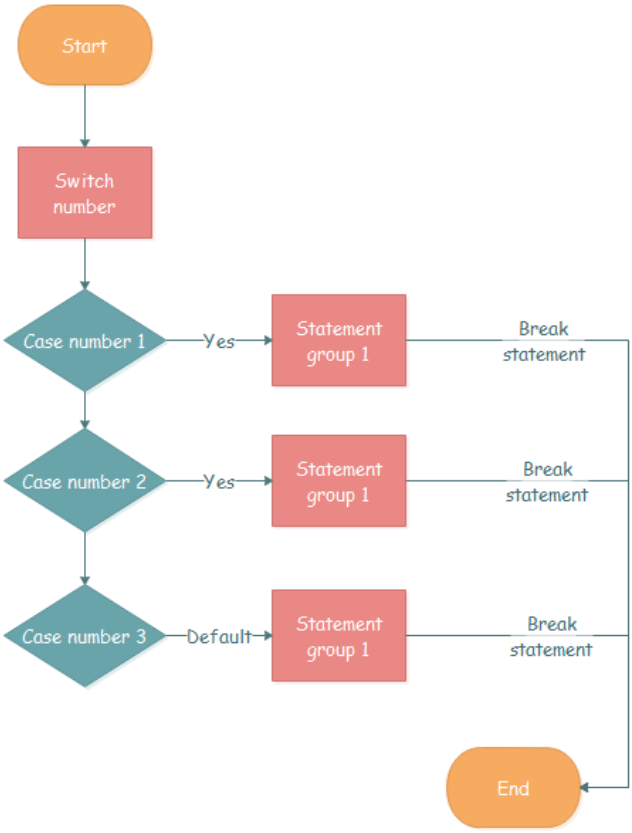
```
if (condition1) {
  // block of code to be executed if condition1 is true
} else if (condition2) {
  // block of code to be executed if the condition1 is false and condition2 is true
} else {
  // block of code to be executed if the condition1 is false and condition2 is false
}
```

- If condition1 evaluates to true, the code block 1 is executed.
- If condition1 evaluates to false, then condition2 is evaluated.
- If condition2 is true, the code block 2 is executed.
- If condition2 is false, the code block 3 is executed.

Switch Statement:

Switch case statements are a substitute for long if statements. A switch statement allows a variable to be tested for equality against a list of values. Each value is called a case, and the variable being switched on is checked for each switch case.

```
switch (n)
{
    case 1: // code to be executed if n = 1;
        break;
    case 2: // code to be executed if n = 2;
        break;
    default: // code to be executed if n doesn't match any cases
}
```


Start
Switch number
Case number 1
Yes
Statement group 1
Break statement
Case number 2
Yes
Statement group 1
Break statement
Case number 3
Default
Statement group 1
Break statement
End

Lab Task:

1. Write a C++ program that prompts the user to input three integer values and find the greatest value of the three values.
2. Write a C++ Program to make a Simple Calculator to Add, Subtract, Multiply or Divide Using switch...case.
3. Write a C++ program to check whether a given number is even or odd.
4. Write a C++ program to check whether an alphabet entered by user is a vowel or a consonant; using if else statement.
5. Write a program for checking if the character entered by the user is a lower case letter or an upper case letter. Once identified, your program should convert it into the corresponding letter in other category (i.e. 'e' should be converted to 'E' and vice versa). Make the console window intuitive. Attach outputs of both cases.
   Hint: Make use of ASCII table.

Home Task:

1. Write a C++ program that determines a student's grade. The program will read three types of scores (quiz, mid-term, and final scores) and determine the grade based on the following rules:
   - if the average score is greater than and equal to 90%, grade will be A
   - if the average score greater than and equal to 70% and less than 90%, grade will be B
   - if the average score greater than and equal to 50% and less than 70%, grade will be C
   - if the average score less than 50%, grade will be F
2. Write a C++ program to find all roots of a quadratic equation.

$$ax^2 + bx + c = 0$$

A quadratic equation can have either one or two distinct real or complex roots depending upon nature of discriminant of the equation. Where discriminant of the quadratic equation is given by

$$\Delta = b^2 - 4ac$$

Depending upon the nature of the discriminant, formula for finding roots is be given as.
Case 1: If **discriminant is positive**. Then there are two real distinct roots given by.

$$\frac{-b+\sqrt{\Delta}}{2a} \quad \text{and} \quad \frac{-b-\sqrt{\Delta}}{2a}$$

Case 2: If **discriminant is zero** then, it has exactly one real root given by.

$$-\frac{b}{2a}$$

Case 3: If **discriminant is negative** then, it has two distinct complex roots given by.

$$\frac{-b}{2a} + i\frac{\sqrt{-\Delta}}{2a} \quad \text{and} \quad \frac{-b}{2a} - i\frac{\sqrt{-\Delta}}{2a}$$

3. Write a C++ Program to Check Whether a Number is Prime or Not.
4. Write a C++ Program to Check Leap Year.
5. Write a C program print total number of days in a month using switch case.
6. Check whether the number entered by the user is positive or not. If it is positive then calculate how many digits the number have.

Useful links for practice

https://www.w3schools.com/
https://www.codecademy.com/learn/learn-c-plus-plus