



**Faculty of Information Technology, University of Moratuwa**  
**BSc. (Hons) in Information Technology**  
**BSc. (Hons) in Artificial Intelligence**  
**IN1101 - Programming Fundamentals**

**Level 1 – Semester 1**

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## **Selections in C**

Control structures are consisting of conditional statements and repetitions. Conditional statements take an important part in programming, a brief introduction to conditional statements is included in this lab session.

### **Control Structures**

For practical use of computers, selective and repetitive executions are necessary. In the C language, there are many control structures used to handle repetitions and conditional statements. C language consists of the following control structures: **if-else**, **switch**, **while**, **do-while**, **for**, **break**, and **continue**. All though all of them can perform operations such as repetitions or conditional, each one of them is convenient for a particular requirement.

### **Conditional Statements**

The program makes a selection or decision based on some condition. There are three main types of statements in the C language for selective operations. They are;

- **if statement**
- **if-else ladder**
- **switch case**

### **if Statement**

If there is no else clause, an if statement is a one-way selection. If statement is a branching conditional statement. In a conditional branching statement, a condition is evaluated, and a statement or group of statements is executed if the expression in the parenthesis evaluates to true. The basic structure of an if statement is as follows:

Syntax:

```
if (expression)  
    Statement1;
```

When the condition in the parenthesis evaluates to true, and more than one statement is to be executed, these statements should be enclosed in curly brackets {}.

```
if (expression) {  
    Statement1;  
    Statement2;  
}
```

Here a compound statement composed of several statements bounded by braces can replace the single statement.

Example 1	Example 2
<pre>#include&lt;stdio.h&gt; void main(){     int age;      printf("Input your age:");     scanf("%d", &amp;age);      if(age&gt;=18)         printf("You can vote"); }</pre>	<pre>#include&lt;stdio.h&gt; void main(){     int age;      printf("Input your age:");     scanf("%d", &amp;age);      if(age&gt;=18){         printf("You can vote");         printf("You may happy");     } }</pre>

### if-else Statement

The if-else statement is used to carry out a logical test as you learnt above and then take two possible actions depending on the outcome of the condition (i.e., whether the outcome is true or false).

Syntax:

<pre>if (condition)     statement else     statement</pre>	<pre>if (condition){     statements } else{     statements }</pre>
--	--

If the condition specified in the if statement evaluates to true, the statements inside the if block is executed and then the control gets transferred to the statement immediately after the if block. Even if the condition is false and no else block is present, control gets transferred to the statement immediately after the if block.

The else part is required only if a certain sequence of instructions needs to be executed if the condition evaluates to false. It is important to note that the condition is always specified in parentheses and that it is a good practice to enclose the statements in the if block or in the else block in braces, whether it is a single statement or a compound statement.

**Example:**

The following program checks whether the entered number is positive or negative.

```
#include<stdio.h>

void main(){
    int a;

    printf("Enter a number:");
    scanf("%d", &a);
    if(a>=0)
        printf("Number is positive");
    else
        printf("Number is negative");
}
```

**if and else-if Statements (if-else ladder)**

The decision-making feature of the C programming language makes it easier to design statements that are driven by decisions and to carry out specific sets of code based on the results of those statements.

The if-else-if decision-making ladder in the C programming language allows users to select one choice from among several possibilities. The if statements in the C programming language are processed from top to down order. As soon as one of the conditions controlling the if evaluates to true, the statement connected to that if is carried out, and the remainder of the else-if ladder is skipped over entirely. In the event that none of the conditions are satisfied, the last else statement will be executed.

<pre>if (condition1)     statement else if (condition2)     statement else if (conditionN)     statement</pre>	<pre>if (condition1){     statements }  else if (condition2){     statements }  else if (conditionN){     statements }</pre>
--	--

The above format is called the if-else **ladder**. During the execution of a nested if else statement, as soon as a condition is encountered which evaluates to true, the statements associated with that particular if block will be executed and the remainder of the nested if-else statements will be bypassed. If neither of the conditions are true, either the last else block is executed or if the else block is absent, the control gets transferred to the next instruction present immediately after the if-else ladder.

### Example

```
#include<stdio.h>

void main() {
    int var1, var2;
    printf("Input the value of var1:");
    scanf("%d", &var1);
    printf("Input the value of var2:");
    scanf("%d", &var2);
    if (var1 > var2)
        printf("var1 is greater than var2");
    else if (var1 < var2)
        printf("var1 is less than var2");
    else
        printf("var1 is equal to var2");
}
```

### Nested if-else Statements

If-else statements can be nested inside another if block or else block or both.

#### Example:

```
#include<stdio.h>
void main() {
    int var1, var2;

    printf("Input the value of var1:");
    scanf("%d", &var1);
    printf("Input the value of var2:");
    scanf("%d", &var2);
    if (var1 != var2) {
        printf("var1 is not equal to var2\n");
        if (var1 > var2) //Here - if-else is nested inside another if block
            printf("var1 is greater than var2\n");
        else
            printf("var1 is less than var2\n");
    } else
        printf("var1 is equal to var2\n");
}
```

In the case of **if-else**, **if-else ladder statements**, if the first **if clause** is true the compiler will never check the rest of the if-else clause and so on.

## Exercise 1

- 1) Write a C program to print the values according to the user input, if  $a > 60$  then print the statement as I like Ice Cream, if  $a > 30$  then print the statement as I like Chocolate, if  $a > 20$  then print the statement as I like Apple otherwise print the statement I do not like anything. (Hint: you should read the value of a through the keyboard.)
- 2) Write a C program to check whether the given year is a leap year or not. (Hint: A leap year is a multiple of 4, and if it is a multiple of 100, it must also be a multiple of 400)
- 3) Take the 3 sides of a triangle as side1, side2, side3 from the user, and write a C program to print whether the triangle is an equilateral, isosceles or scalene triangle.
- 4) Write a C program to take a character as an input from the user and check whether the character is an alphabet or not.
- 5) Write a C program to calculate energy bill. Read the starting and ending meter reading. The charges are as follows:

No of units consumed	Rates in Rupees
201 and above	3.50
101 – 200	2.50
0 – 100	1.50

- 6) Write a C program to display the following grades for given marks.

Marks	Grade
100 – 80	A
79 – 60	B
59 – 40	C
<39	D

- 7) Write a C program to display the name of the day in a week, depending on the number entered through the keyboard.  
Ex:  
1 - Monday  
2 - Tuesday

- 8) It was decided to base the fine for speeding in a built-up area as follows:

50 pounds if speed is between 31 and 40 mph
75 pounds if the speed is between 41 and 50 mph
100 pounds if the speed is above 50 mph

Write a C program to calculate the fine when the speed given from the keyboard.

- 9) National book center decides to give a discount for their customers. The discount of 15% is given to the customer if purchase amount exceeds 5000 and 10% given if not. Write a C program to print the amount customer need to pay when they input the purchase amount.

## Switch Case

Switch case is called an n-way selector like if else ladder which you learnt early. 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 case.

Consider the below if-else ladder to find out the section name according to the given section number.

If-else ladder	Switch case
<pre>if (section == 1)     printf("IT101"); else if (section == 2)     printf("IT102"); if (section == 12)     printf("IT112"); else     printf("Wrong Section");</pre>	<pre>printf("Enter the section:"); scanf("%d", &amp;section);  switch(section){     case 1:         printf("IT101");         break;     case 2:         printf("IT102");         break;     case 12:         printf("IT112");         break;     default:         printf("Wrong Section");         break; }</pre>

**Note:** Without a break, the next case is also executed.

```
printf("Enter value for x:"); scanf("%d", &x)
```

```
switch (x)
```

```
{
    case 0: printf("0");
    case 1: printf("1");
    default : printf("2");
}
```

Output:

- When x is 0, all of 0, 1 and 2 are printed
- When x is 1 both 1 and 2 are printed

## Exercise 2

1. Write a C program to print the values according to the keyboard reading if a=20 then print the statement as I like Ice Cream, if a=30 then print the statement as I like Chocolate, if a=60 then print the statement as I like Apple otherwise print the statement I do not like anything. (Hint: you should read the value through the keyboard)
2. Write a program that takes as input a letter and displays if it is a vowel or consonant using a switch statement.
3. Write a C program to display the name of the day in a week, depending on the number entered through the keyboard.

Ex: 1- Monday

2- Tuesday

4. National book centre decides to prepare a Book Club. Members of the club are entitled to special discounts on the purchase of the book. The discount of 15% is given to the members of the purchase amount exceeds 5000 and 10% is given if it doesn't exceed. Non-members aren't normally given any discount. However, if their purchase exceeds Rs. 5000, a discount of 7% is given. Write a C program to analyze the above problem and find the net purchase amount.  
Note: use if-else statements where switch-case statements are not possible.
5. Write a program to calculate the area of a circle, a rectangle or a triangle depending upon the user's choice.
6. Write a C program to display the following comments for given grades.

Grade	Comment
A	Excellent
B	Well Done
C	Well Done
D	You Pass
F	Better Try Again
Other	Invalid Grade

- 7) Write a C program to create a simple calculator for addition, subtraction, multiplication and division using switch statement. Get the user inputs as

Two operands (numbers)

An operator (eg: "+", "-", "\*", "/")



- 8) Find the number of days for the given year and month.
- 9) Write a C program to display the following country name for given telephone code in India.

Telephone Code	Area Name
11	Delhi
22	Mumbai
33	Kolkata
40	Chennai
Other	Area code is not recognized