Lab# 05

Decision Control Structure

5.1 Objective

The student should practice the following statements:

1. if statemets
2. if-else statements
3. Nested if/if-else
5. Switch statement¨

5.2 Scope

By the end of this lab a student should know:

1. Syntax of if and nested if statements.
2. Syntax of switch and nested switch statements.

5.3 Useful concept

If Statement:

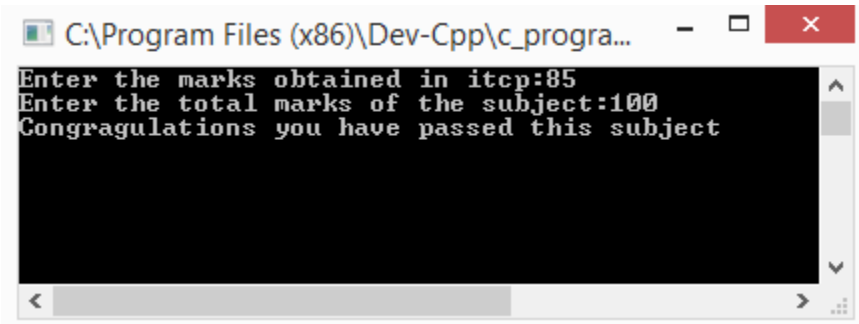
Sometimes in your program you need to do something if a given a condition is satisfied. Suppose for example, you want to display a congratulatory message in case a student has passed a course, the marks must be greater than 50%.

5.4 Examples

```
#include<conio.h>
#include<stdio.h>
int main ()
{
        int marks,total,percent=0;
        printf("Enter the marks obtained in itcp:");
        scanf("%d", &marks);
        printf("Enter the total marks of the subject:");
        scanf("%d",&total);
        percent= (marks*100)/total;
        if (percent>=50)
        printf("Congragulations you have passed this subject");
```

```
        getch();
}
```

Output for the above program is



If you want to execute more than one statement based on that condition, then your statements should be enclosed with brackets. For example

```
#include<conio.h>
#include<stdio.h>
int main ()
{
        int marks,total,percent=0;
        printf("Enter the marks obtained in itcp:");
        scanf("%d", &marks);
        printf("Enter the total marks of the subject:");
        scanf("%d",&total);
        percent= (marks*100)/total;
        if (percent>=50)
        {
        printf("Congragulations you have passed this subject");
        printf("Well done");
        }
         getch();
}
```

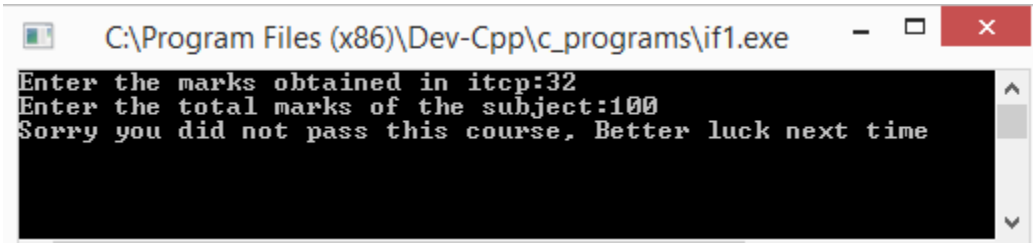
If-else statements

In case you want to have an alternative action to be taken if the condition is not satisfied, then use an if-else statement. For example:

```
#include<conio.h>
```

```
#include<stdio.h>
int main ()
{
        int marks,total,percent=0;
        printf("Enter the marks obtained in itcp:");
        scanf("%d", &marks);
        printf("Enter the total marks of the subject:");
        scanf("%d",&total);
        percent= (marks*100)/total;
        if (percent>=50)
        {
        printf("Congratulations you have passed this subject");
        }
        else
        printf(" Sorry you did not pass this course, Better luck next time");
         getch();
}
```

The output for the above program in case the condition is not satisfied (else part is executed) is shown below



Here, if the condition is true, the if-part will be executed and the else-part is ignored. But if the condition is false, the if-part is ignored and the else-part is executed.

Be careful with compound statements, forgetting the brackets will produce an error because only the first statement is executed if the condition is true, the rest are considered to be unrelated statements and the compiler will complain about the keyword else.

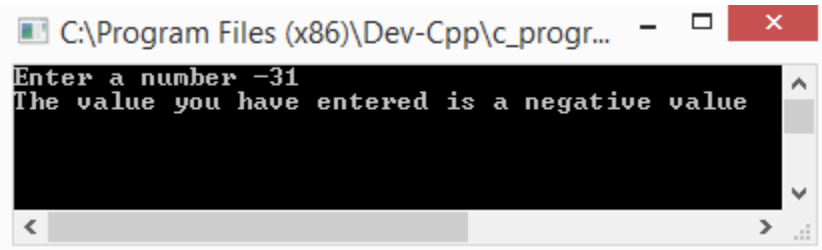
Example: Input a number from user and display whether it is a positive or negative number

```
#include<conio.h>
#include<stdio.h>
int main ()
{
```

```
        int value;
        printf("Enter a number ");
        scanf("%d", &value);
        if (value>0)
        printf("The value you have entered is a positive number");
        else
        printf("The value you have entered is a negative value");
         getch();
}
```

Output for the program with if condition being true

Output for the same program with if condition false



Multiple if-else-if statements

If-else-if statement can be used to choose one block of statements from many blocks of statements. It is used when there are many options and only one block of statements should be executed on the basis of a condition. Consider the following example

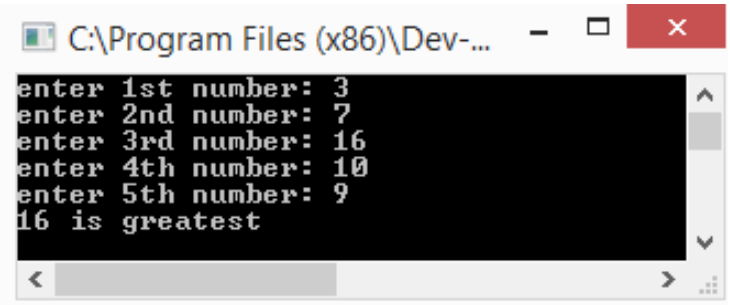
Example: Input 5 values from the user and display the maximum number from the list.

```
#include<stdio.h>
#include<conio.h>
int main ()
{
        int a,b,c,d,e;
```

```
printf("enter 1st number: ");
scanf("%d",&a);
printf("enter 2nd number: ");
scanf("%d",&b);
printf("enter 3rd number: ");
scanf("%d",&c);
printf("enter 4th number: ");
scanf("%d",&d);
printf("enter 5th number: ");
scanf("%d",&e);
if(a>b&&a>c&&a>d&&a>e)
{
printf("%d is greatest",a);
}
else
if(b>a&&b>c&&b>d&&b>e)
{
printf("%d is greatest",b);
}
else
if(c>a&&c>b&&c>d&&c>e)
{
printf("%d is greatest",c);
}
else
if(d>a&&d>b&&d>c&&d>e)
{
printf("%d is greatest",d);
}
else
if(e>a&&e>b&&e>c&&e>d)
{
```

```
        printf("%d is greatest",e);
        }
        getch();
}
```

The output for this program is

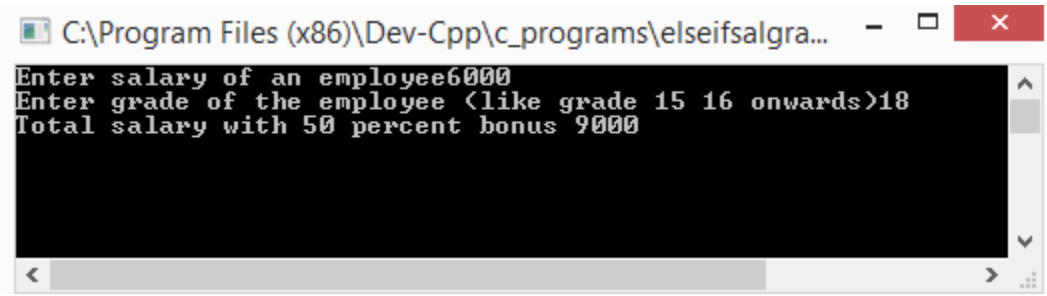


Example: Prompt the user to enter the salary and grade of an employee. If the employee has a grade greater than 15 then add 50% bonus to the employee's salary. Otherwise if the employee's grade is less than 15 then add 25% bonus to the employee's salary.

```
#include<stdio.h>
#include<conio.h>
int main()
{
        int grad,sal,bonus;
        printf("enter salary");
        scanf("%d",&sal);
        printf("enter grade");
        scanf("%d",&grad);
        if (grad>15)
        {
        bonus=sal*(50.0/100.0);
        printf("total salary with 50 percent bonus %d",bonus+sal);
        }
        else if (grad<=15)
        {
        bonus= sal* (25.0/100.0);
        printf("total salary with 25 percent bonus %d",bonus+sal);
        }
```

```
    getch();
}
```

The output of this program is



Here each condition is tested one by one starting from the first one. If one of them is true, then the statement associated with that condition is executed and the rest are ignored.

Nested if structure:

An if statement within an if statement is called nested if statement. In nested structure, the control enters into the inner if only when the outer condition is true. Only one block of statements are executed and the remaining blocks are skipped automatically.

The user can use as many if statements inside another is statements as required. The increase in the level of nesting increases the complexity of nested if statement.

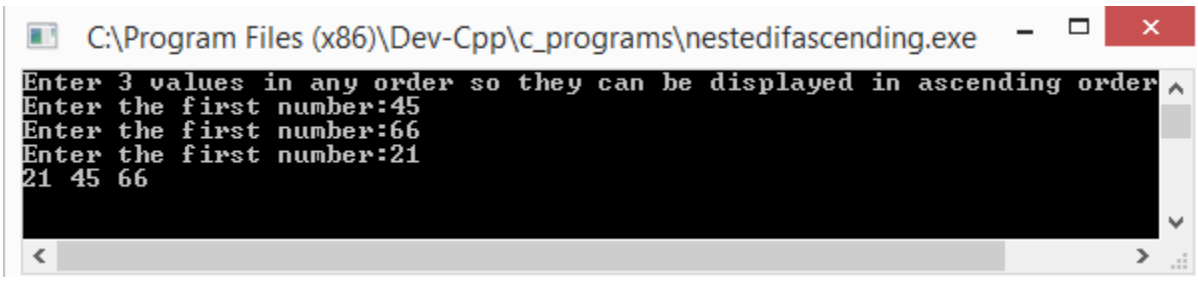
Example: Prompt the user to input three values so as to display them in ascending order.

```
#include<stdio.h>
#include<conio.h>
int main ()
{
        int a,b,c;
        printf("Enter 3 values in any order so they can be displayed in ascending order:");
        printf("\nEnter the first number:");
        scanf("%d",&a);
        printf("Enter the first number:");
        scanf("%d",&b);
        printf("Enter the first number:");
        scanf("%d",&c);
        if(a<b && a<c)
        {
                        if (b<c)
```

```
                printf("%d %d %d", a,b,c);
                else
                printf("%d %d %d", a,c,b);
        }
        if(b<a && b<c)
        {
                if (a<c)
            printf("%d %d %d", b,a,c);
                 else
                printf("%d %d %d", b,c,a);
        }
        if (c<a && c<b)
        {
                 if (b<a)
                 printf("%d %d %d", c,b,a);
                 else
            printf("%d %d %d", c,a,b);
        }

        getch();
}
```

Output for this program is shown below



Switch statement:

Another useful statement in C is the switch statement. This statement is somehow similar to if statement in giving you multiple options and do actions accordingly. But its behaviour is different.

This statement tests whether an expression matches one of a number of constant integer values labelled as cases. If one matches the expression, execution starts at that case. This is the general structure of the switch statement:

```
switch (expression)
{
        case constant:  statements
         break;
        case constant:  statements
        case constant:  statements;
        break;
        default: statements
}
```

The default clause is optional. If it is not there and none of the cases matches, no action is taken. The break keyword is used to skip the switch statement. For example if a case matches the expression and no break key words are used, the execution will go for all the statements in all cases.

Consider this example:

```
#include<stdio.h>
#include<conio.h>
int main ()
{
        char grade;
        printf("Enter a grade in capital letters");
        scanf("%c",&grade);
        switch(grade)
        {
                case 'A':
                printf("You have scored 90% marks");
                break;
        case 'B':
                printf("You have scored 80% marks");
                break;
```

```
        case 'C':
                printf("You have scored 70% marks");
                break;
        case 'D':
                printf("You have scored 60% marks");
                break;
        case 'F':
                printf("You have scored less than 50%");
                break;
        default:
                printf("You have entered an invalid grade");
                break;
        }
        getch();
}
```

5.5 Exercise for Lab

Exercise1: Prompt the user to input 5 values and display the minimum number amongst them.

Exercise2: Input 5 values from the user and display the number of positives, the number of negatives and the number of zeros amongst the 5 values.

Exercise3: Prompt the user to input a character and display whether it is a vowel or consonant using switch statement.

5.6 Home Task

1. Ask the user to enter marks obtained in a course and the total marks of the course. Then display a menu

   Press 1 to calculate percentage.

   Press 2 to display grade.

   If the user presses 1 then percentage should be displayed and if the user presses 2 the grade against the marks should be displayed. (Hint: use switch statement for menu selection and else if to display the grade).
2. Prompt the user to enter 3 values. For any equal values, the program should display the numbers that are equal. (For example user input 34,6,34 the program should display the message that the 1st and 3rd values are equal).