East West University

Department of Electrical & Electronic Engineering
Plot No-A/2, Main Road, Jahurul Islam City, Aftabnagar, Dhaka-1219

Lab Manual

Course : EEE 105
Credit Title : Computer Programming
Instructor : Nusrat Jahan Ananna, Lecturer, EEE Department

Lab-1: Introduction to C Programming

Objective

- Familiarizing with computer and windows operating system
- Familiarizing with C language and integrated development environment (IDE)
- Your First C program.

An example of a program in C:

```
#include <stdio.h>
int main( )
{
                printf(“Dhaka\tChittagong Khulna Sylhet");
               printf(“\nBarishal \t\tRangpur");
              return 0 ;
}
```

Output:

```
Dhaka           Chittagong Khulna Sylhet
        Barishal                        Rangpur
```

Problem 1:
Write a program to print the following in C language.

```
There are six divisions in Bangladesh
      Dhaka
      Chittagong
      Rajshahi
      Khulna
      Sylhet
      Bangladesh

I live in Dhaka.
```

Problem 2:
Write a program to print the following in C language.

```
My Family Information-
    Name: Devid
    Father: Daud
    Mother: Stella

Education Information:
    School: Saint Joseph School
    College:Mirpur College
    University: East West University
```

Problem 3:

Write a program to print the following in C language.

```
First Line: Your name
          Second Line: House no#, Apt#
Third Line: Post code#, City
        Forth Line: Country name
```

Problem 4:

Write a program to print the following in C language.

```
------------------------------------------------
------------------------------------------------
|| Name :-- MD. Al Amin ||
|| House  No:-- 45, Street:- Fular Road||
||City:-- Dhaka, Post Code:-- 1217 ||
------------------------------------------------
------------------------------------------------
```

Problem 5:
Write a program to print the following in C language.

```
*
* *
* * *
* * * *
```

Problem 6:

Write a program to print the following in C language.

```
5 * 1 =5
          5 * 2 =10
5 * 3 =15
          5 * 4 =20
5 * 5 =25
          5 * 6 =30
5 * 7 =35
          5 * 8 =40
5 * 9 =45
          5 * 10 =50
```

Problem 7:

Write a program to print the following in C language.

```
-----------                          --------
|         |                        |     |
|         |>>-------------------> |     |
-----------                         ---------
```

Home Work:

Hello World	Hello World	H e l l o
* ** *** ****	**** *** ** *	***** * * * * *****
* *** ***** * * * * *	* *** ***** * * * * ***** *** *	**** **** **** * * * * **** **** * * * **** **** ****

You have to print the above TEXT using *printf* and *n* only.

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Lab-2:Inputs, Output and Arithmetical expressions

Aims: By the end of the workshop you should be able to understand: -

- Detail of C’s scanf and printf functions
- How to take input from keyboard through scanf ?
- How to evaluate a arithmetical expression with C?

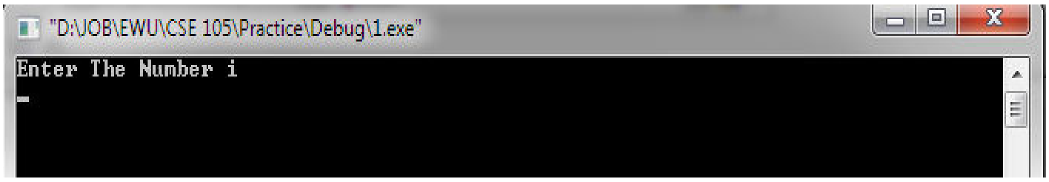
In the previous lab we go through the *printf* in detain. So, we can start with *scanf*. As discussed in the class *scanf* is the C library’s counterpart to *printf*. Actually, *scanf* requires a format string to specify the appearance of the input data. Example of using scanf to read an int value:

scanf("%d", &i);

The above code will read an integer and stores into variable i. The & symbol is usually (but not always) required when using scanf.Now write the following code:

```
#include <stdio.h>
int main()
{
     int i;
     printf("Enter The Number i\n");
     scanf("%d",&i);
     printf("Your Entered Integer is = %d",i);
      return 0;
}
```

1. Compile and execute the above code.
2. When you execute the code you will certainly see a screen like this.

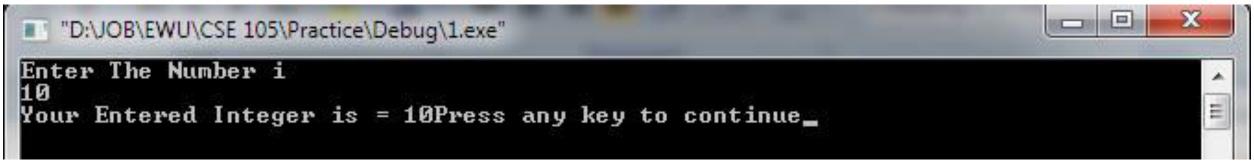


"D:\JOB\EWU\CSE 105\Practice\Debug\1.exe"

```
Enter The Number i
_
```

3. If not then there is obviously something wrong in your code, in that case knock your teacher.
4. If there is nothing wrong enter **10** form your keyboard and press enter.

5. Your output should be as follows, otherwise knock your teacher.



"D:\JOB\EWU\CSE 105\Practice\Debug\1.exe"

```
Enter The Number i
10
Your Entered Integer is = 10Press any key to continue_
```

6. Now execute the code again and take **10.50** form your keyboard.
7. The output should be the same as in step 5. In output **.50** is missing, this is because we take the variable *i* as an integer. If we want to print the exact **10.50,** we should declare variable***i* as float or double.**
8. Reading a float value requires a slightly different call of *scanf*:
   scanf("%f", &i);
   "%f" tells scanf to look for an input value in float format *i.e.* the number may contain a decimal point, but doesn't always have to.
9. If youdeclare *i* as double your *scanf* should be as follows:
   scanf("%lf", &i);
   "%lf" tells scanf to look for an input value in double format.
10. For the *printf* you have to use %d or %f or %lf respectively. Look at table 1 for more detail. Don't worry about the **char and string** we will discuss more detail in the upcoming labs.

	printf	scanf
int	%d	%d
float	%f	%f
double	%f	%lf
char	%c	%c
string	%s	%s

11. If you want to enter more than one value i.e., serialized the inputs you can do it by the following code.

```
float height, weight;
… … … … … … … … … … … … … … … … … …

      scanf(“%f%f”, &height, &weight);
```

Exercise 1: In this initial exercise you are asked to calculate the volume of a room. As you know ***volume = width ×height×length.***In the C this formula will be ***volume = height * length * width;***
That is operation * in C is same as × in mathematics. For more operators in C look at following table

Your job is to declare width, height and length as double. Write the code to take these as input from keyboard. Print the volume.

Sample input	Sample Output
Enter height of box: 10 Enter length of box: 10 Enter width of box: 10	Volume (cubic inches): 1000
Enter height of box: 10 Enter length of box: 30.50 Enter width of box: 50.75	Volume (cubic inches): 15478.750000

Exercise 2: The following formula is used to calculate the Celsius equivalent of a Fahrenheit temperature:

$$\mathbf{C = (5/9) *(F - 32)}$$

Where **F** is the temperature in Fahrenheit and **C** is the Celsius equivalent of that temperature. Write a program in C to convert the temperature in Fahrenheit to the equivalent Celsius temperature.

Sample input	Sample Output
Enter Fahrenheit Temperature: 20	Temperature in Fahrenheit: 20 Temperature in Celsius: -6

Exercise 3: Write a program to calculate the area and the perimeter of a circle using the formulas **area = ∏r^2** and **perimeter = 2∏r**, where ∏ is a constant whose value is 3.1415926 and **r** is the radius of the circle. Use float type variable for **r**.

Sample input	Sample Output

Enter the radius: 4.0	Area = 50.265482
	Perimeter = 25.132741

Exercise 4: Compute the straight line distance between two points in a plane. i.e. your job is to take the points as input from keyboard and print the outputs. The coordinates of points should be declared as float and for this you should know how to use ***sqrt()***with ***#include<math.h>***as discussed in the class.

Sample input	Sample Output
Enter Point X1: 1.0 Enter Point X2: 4.0 Enter Point Y1: 5.0 Enter Point Y2: 7.0	The distance is 3.605551
Enter Point X1: 11.0 Enter Point X2: 14.0 Enter Point Y1: 5.0 Enter Point Y2: 8.0	The distance is 4.242640

Home Work:

Problem 1: A computer manufacturing company has the following monthly compensation policy to their sales-persons:

Minimum base salary	:	1500.00
Bonus for every computer sold	:	200.00
Commission on the total monthly sales	:	2 percent

Given the base salary, bonus and commission rate, the inputs necessary to calculate the gross salary are, the price of each computer and the number sold during the month.
Calculate the gross salary of a sales-person.

Sample input	Sample Output

Enter the number of computers: 5
Price of each computer:
40000
	Bonus = 1000.00
	Commission = 4000.00

Problem 2: Write a program to convert the distance in miles and yards to kilometer. To convert miles to kilometers, multiply by the conversion factor 1.609. [1 mile = 1760 yards]

Sample input	Sample Output
Enter the distance in miles and yards Miles: 26 Yards: 385	The distance in kilometer is: 42.185970 km

Problem 3: Write a program to evaluate the following function for different values of x. [**Hints**: use **math.h** functions, pow(), sin(), sqrt()]

$$f(x) = 3x^5 - 5\sqrt{x} - 6\sin(x)$$

Sample input	Sample Output
Enter x : 5	f(x) = 9369.5732

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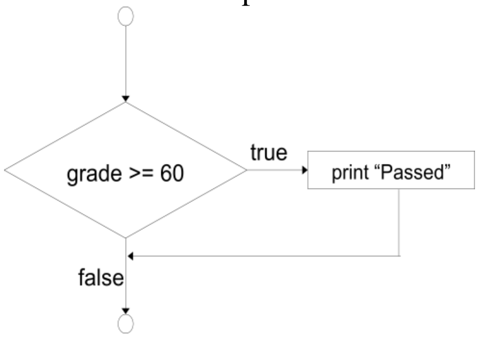
Lab-3: Selection Statements ***if***, ***if-else***, ***if-else-if***, Switch and Conditional operators

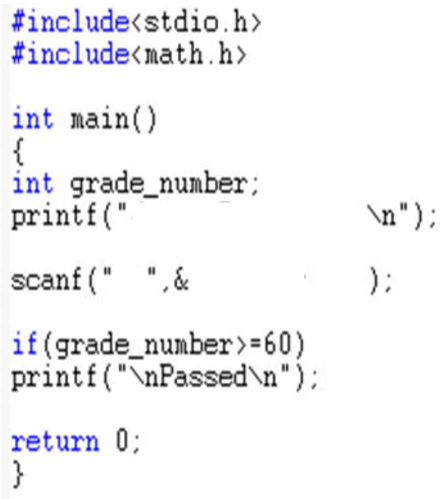
As discussed in the class, selection structures are used to choose among alternative courses of action: In this problem we want to check whether a student is passes or failed. According to the rule of EWU If the marks of a student is greater than or equal to 60 he/she "Passed". Thus, the flowcharts of this problem will be as follows:



In C we can do this using a single *if*, which is shown below.

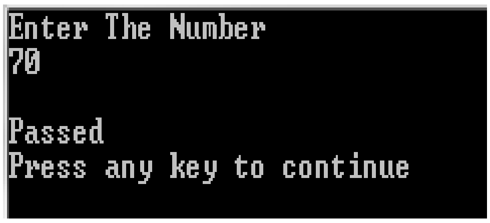
```
if(grade>=60)
   printf( "Passed\n" );
```

Exercise 1: Consider the following code

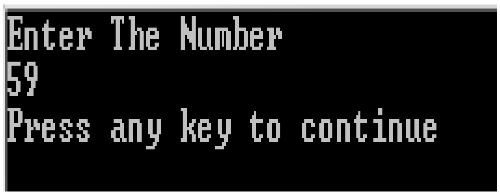


```
#include<stdio.h>
#include<math.h>

int main()
{
int grade_number;
printf("                \n");

scanf("  ",&          );

if(grade_number>=60)
printf("\nPassed\n");

return 0;
}
```

i. **Fill the *printf* and *scanf*** lines such that the output is as follows:



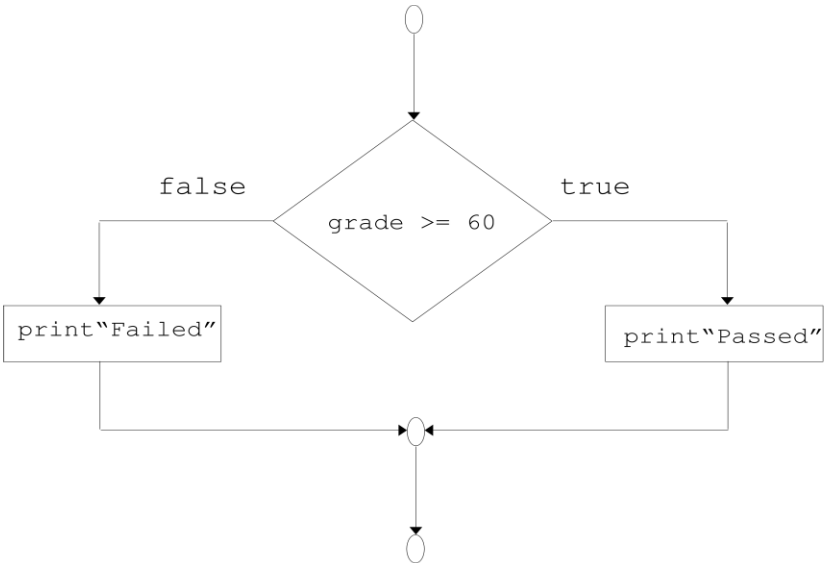
```
Enter The Number
70

Passed
Press any key to continue
```



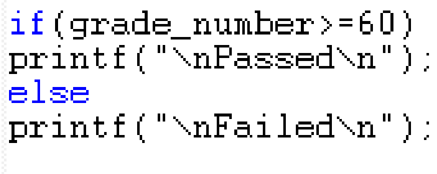
```
Enter The Number
59
Press any key to continue
```

ii. As you see there is no output for the input 59 .This is because ***if*** statement is a single-entry/single-exit structure, i.e. our code will perform action for the true condition only.

iii. Using an ***else*** concatenate with ***if*** we can easily covert the above code such it can perform an action (for example print failed) for the false condition too. In that case, it flow chart will be as follows



iv. In the above code replace the ***if parts*** with the following code.



```
if(grade_number>=60)
printf("\nPassed\n");
else
printf("\nFailed\n");
```

v. What is the output for the input **70** and **59**here?

In the ***if*** statement template, notice that statement is singular, not plural:

```
if(expression)
          Statement
```

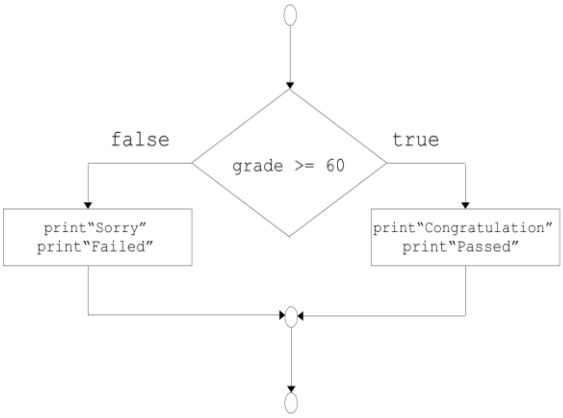
To make an ***if*** statement control two or more statements, generally we use a compound statement. A compound statement has the form

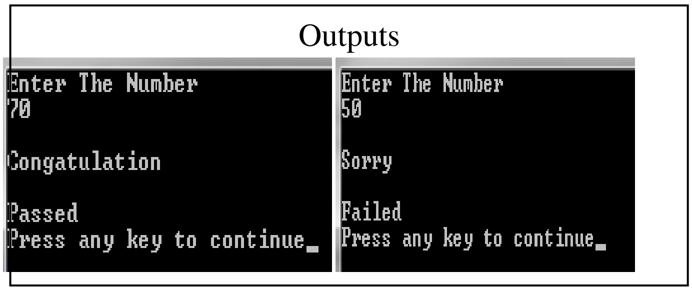
```
{
  Statement_1;
  Statement_2;
  …   …     …
  Statement_n;
}
```

Placing braces around a group of statements forces the compiler to treat it as a single statement, i.e., for the following C code, all n statements will be executed if the expression is true.

```
if(expression)
     {
          Statement_1;
          Statement_2;
          …     …     …
          Statement_n;
     }
```

Exercise 2: Consider the following flowchart, and Modify your code of exercise 1, such that it can comply outputs shown in right





```
Enter The Number
70

Congatulation

Passed
Press any key to continue_
```

```
Enter The Number
50

Sorry

Failed
Press any key to continue_
```

Note: For this you should use separate ***printf*** for each text i.e., one ***printf*** for Sorry, one for Failed, one for Congratulations and another one for Passed .

Exercise 3: You are given two integer numbers. Find the quotient and remainder. When 2nd input is zero, you should print “Error!! Can’t divide.”

Sample Input	**Sample Output**
17 5	Q=3, R=2
3 0	Error!! Can’t divide.

Exercise 4: In this exercise you need to write a program that will take an integer input representing year and print whether this is a leap year or not leap year.

Sample Input	**Sample Output**
2000	Leap Year
2003	Not Leap Year

Exercise 5: Write a C code that can check whether a number is odd or even. Your number should be input from the keyboard. If the number is odd your program should print "The number you entered is ODD" otherwise it should print "The number you entered is EVEN". A number is odd *if the number mod 2 equals to zero*, otherwise it is an even number.

Sample input	Sample Output
Please Enter your number : 11	The number you entered is ODD
Please Enter your number : 120	The number you entered is EVEN

Exercise 6: Given a score and the following grading scale write a program with *if-else-if* only to find the corresponding grade.

90-100	A
80-89	B
70-79	C
60-69	D
0-59	F

Your program should have proper error checking. For example, if a user input a negative number or more than 100 it should print "Invalid input."

Sample input	Sample Output
Please Enter the number : 97	Grade is A.
Please Enter the number : 75	Grade is C.
Please Enter the number : 107	Invalid input.

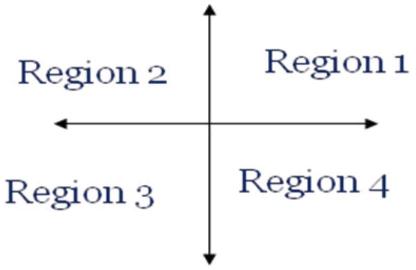
Exercise 7: Suppose we have two tasks A and B, A takes Ah hours, Am minutes, and As seconds. On the other hand B takes Bh hours, Bm minutes, and Bs seconds. Write if-else statements to print out which task takes more time?

Sample input	Sample Output
Please Enter Ah = 10 Please Enter Am = 13 Please Enter As = 35 Please Enter Bh = 11 Please Enter Bm = 0 Please Enter Bs = 0	B takes more time.
Please Enter Ah = 11 Please Enter Am = 12 Please Enter As = 13 Please Enter Bh = 8 Please Enter Bm = 35 Please Enter Bs = 37	A takes more time.

Exercise 8: Write a program that reads 3 integer numbers a, b and c from user and computes minimum, median and maximum of the numbers.

Sample input	Sample Output
Please Enter a = 2 Please Enter b = 5 Please Enter c = 3	Min = 2, Max = 5, Median = 3
Please Enter a = 2 Please Enter b = 2 Please Enter c = 3	Min = 2, Max = 3, Median = 2

Exercise 9: Write a program that reads a point (x, y) from user and prints its region



Sample input	Sample Output
Please Enter x, y: 3 -1	This point is in Region 4
Please Enter x, y: -1 -5	This point is in Region 3

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Lab-4: Basic Program Control: Loops.

Loop control statements are one of the most important parts of structured programming. The basis of program control starts with loop. In this lab we will go to the detail of C's while loop and do while loop. A while statement is a C looping statement. It allows repeated execution of a statement or block of statements as long as the condition remains true (nonzero). If the condition is not true when the while command is first executed, the statement(s) is never executed. The form while Statement is following:

while (***condition***)
   statement

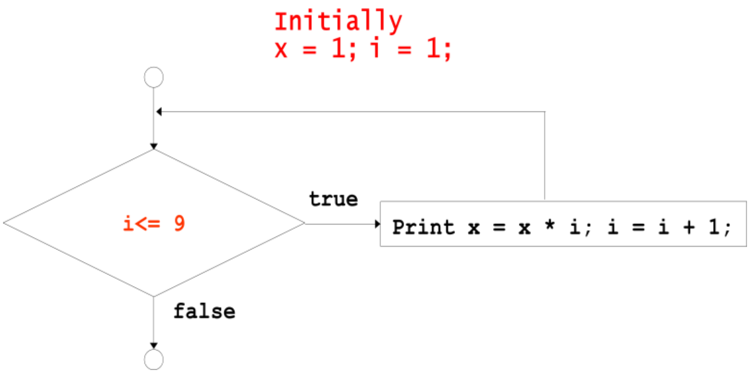
Here, ***condition*** is any valid C expression, usually a relational expression. When condition evaluates to false (zero), the while statement terminates, and execution passes to the statement followingfirst statement; otherwise, the first C statement in the statements is executed. Statement is the C statement that is executed as long as condition remains true. Note that, thestatement issingular here too, not plural alike ***if-else-if.*** To make a***while*** statement control two or more statements, generally we use a compound statement. Compound statement has the form:

```
{
Statement_1;
Statement_2;
…         …         …
Statement_n;
}
```

Placing braces around a group of statements forces the compiler to treat it as a single statement, i.e., for the following C code, all n statements will be executed while the expression is true.

```
        while(condition)
                {
                        Statement_1;
                        Statement_2;
                          …       …       …
                         Statement_n;
                }
```

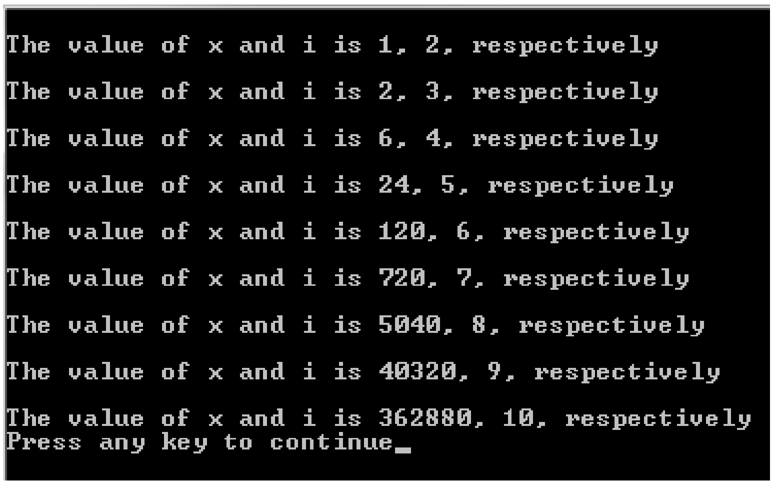
Exercise: 1 Consider the following flowchart,



As you can imagine, this flow chart continuously print the value of ***x*** and ***i*** until ***i*** is becomes greater than 9. In other words, it allows repeated execution of a statements ***x=x*i,*** and ***i=i+1*** as long as the (***i<=9***) remains true. The C code for this problem is as follows,

```
int main()
{
int x = 1, i =1;
while (i<=9)
{
  x = x*i;
  i = i+1;
  printf("\nThe value of x and i is %d, %d, respectively\n", x,i );
}
  return 0;
}
```

Output:



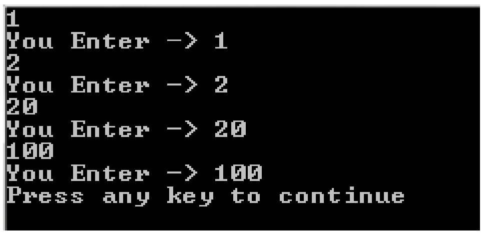
```
The value of x and i is 1, 2, respectively

The value of x and i is 2, 3, respectively

The value of x and i is 6, 4, respectively

The value of x and i is 24, 5, respectively

The value of x and i is 120, 6, respectively

The value of x and i is 720, 7, respectively

The value of x and i is 5040, 8, respectively

The value of x and i is 40320, 9, respectively

The value of x and i is 362880, 10, respectively
Press any key to continue_
```

Your1sttask is to write the above code and match your output will given one.
Can you code program this without loop? Let’s try it for 10 Mins,

Exercise: 2 In this program we want to take input from command line until we get one greater than 99, i.e., our program should repeatedly take inputs form keyboard and print it values. However, if the value of the input is greater than 99 we stop. Write the following code and check you output.

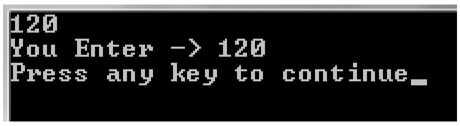
```
int nbr=0;
while (nbr <= 99)
{
```

Output:



```
1
You Enter -> 1
2
You Enter -> 2
20
You Enter -> 20
100
You Enter -> 100
Press any key to continue
```

```
    scanf("%d", &nbr );
    printf("You Enter -> %d\n", nbr );
}
```



```
120
You Enter -> 120
Press any key to continue_
```

Match your output with the given two on right. Next, your task to draw a Flowchart(in a paper)of the above program. Can you solve this problem without loop. The ans is ________.

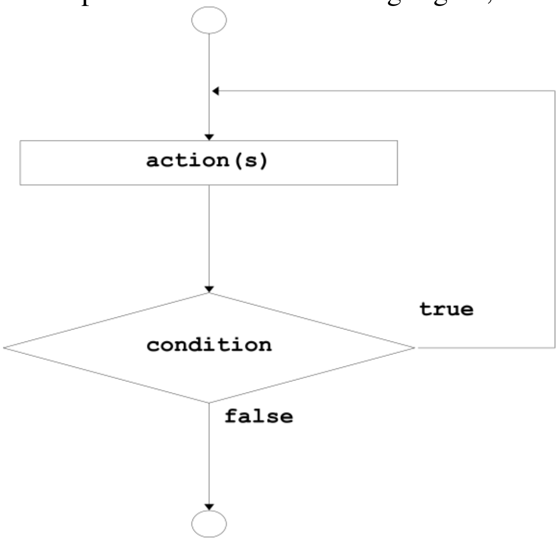
Exercise: 3C's second loop construct is the do...while loop, which executes a block of statements as long as a specified condition is true. The do...while loop tests the condition at the end of the loop rather than at the beginning, as is done by the while loop.The structure of the do...while loop is as follows:

```
do
    statement
while (condition);
```

Here, condition is any C expression, and statement is a single or compound C statement. When program execution reaches a do...while statement, the following events occur:

1. The statements in statement are executed.
2. condition is evaluated.
3. If it's true, execution returns to step 1. If it's false, the loop terminates.

The operation of a do...while loop is shown in the following Figure,



The statements associated with a do...while loop are always executed at least once. This is because the test condition is evaluated at the end, instead of the beginning, of the loop. In contrast, while loops evaluate the test condition at the start of the loop, so the associated statements are not executed at all if the test condition is initially false.The do...while loop is used less frequently than while loops. It is most appropriate when the statement(s) associated with the loop must be executed at least once.

Now, your task is to Code the **Exercise 1 and 2 with do while loop**. The output should be identical as shown in that exercise.

Exercise: 4 Write a program that will take an integer number `n` as input and print the result of the following series:

a. 1+2+3+. . .+n
b. 1+1/2+1/3+. . . + n
c. 1.2+3.4+5.6+. . .+(n-1).n
d. 1.2.3+2.3.4+3.4.5+. . .+n.(n+1).(n+2)
e. 1+2+4+7+11+ . . . (up to `n` numbers)

Sample Input	Sample Output
4	a) 10 b) 2.08 c) 14 d) 210 e) 14

Exercise 5: Write a program that reads two positive integers corresponding to two year values, ensures that the first year value is less than the second, and then determines and outputs all year values for leap years. A leap year is one that can be evenly divided by 4, unless it is a centennial, in which case it must be evenly divided by 400. For example, 1600 and 1992 are leap years, whereas 1700 and 1998 are not. Your program should output all the leap years between this two input years.

Exercise 6: Here, we will solve the Grading problem (LAB 2) in a more specific way. Now, the grading of each course is based on the following weighted scale:

- Term 1 – 20%
- Term 2 – 20%
- Final – 30%
- Attendance – 10%
- Class Tests – 20%

The letter grades are given based on the total marks obtained by a student and is shown below:

- A >= 90%
- B >= 80% &< 90%
- C >= 70% &< 80%
- D >= 60% &< 70%
- F < 60%

Term 1 and Term 2 exams are out of 20 each, Final is out of 30 and Attendance givenis out of 10. Three class tests are taken per semester and the average of best two iscounted towards the final grade. Every class test is out of 20. Example: Say Tara obtained marks of 15, 18, 25 and 8 in Term 1, Term 2, Final and Attendance respectively. Her 3 class test marks are 15, 12 and 17. Since average of best 2 will be counted, her class test mark will be equal to (15 + 17) / 2 = 16. Therefore, total marks = 15 + 18 + 25 + 8 + 16 = 82 and she will be getting a B.

Input: The first line of input is an integer T(T<100) that indicates the number of test cases.Each case contains 7 integers on a line in the order Term1 Term2 Final Attendance Class_Test1 Class_Test2 Class_Test3. All these integers will be in the range [0, total marks possible for that test].

Output: For each case, output the case number first followed by the letter grade {A B C D F}.Follow the sample for exact format.

Sample input	Sample Output

3
 	
15 18 25 8 15 17 12
20 20 30 10 20 20 20
20 20 30 10 18 0 0
	Case 1: B
	Case 2: A
	Case 3: B

Home Works :

1. Write a program that will take a number `n` as input and print `n` lines of output according to the following sample output.

Sample Input	Sample Output

3	1
	2 3
	4 5 6

5	1
	2 3
	4 5 6
	7 8 9 10
	11 12 13 14 15

2. Write a program to read an integer number `n` and print the value of 3^n(using loop).

Sample Input	Sample Output
2	9
4	81
0	1

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Lab Manual

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Lab- 5: Array

Exercise 1:
Type the following code and match your output with the given output.

```
#include <stdio.h>
main()
{
   float expenses[13];
   int count;
    for (count = 1; count < 13; count++)
    {
        printf("Enter expenses for month %d: ", count);
        scanf("%f", &expenses[count]);
    }
    for (count = 1; count < 13; count++)
    {
        printf("Month %d = $%.2f\n", count, expenses[count]);
    }
    return 0;
}
```

Output:

```
Enter expenses for month 1: 100
Enter expenses for month 2: 200.12
Enter expenses for month 3: 150.50
Enter expenses for month 4: 300
Enter expenses for month 5: 100.50
Enter expenses for month 6: 34.25
Enter expenses for month 7: 45.75
Enter expenses for month 8: 195.00
Enter expenses for month 9: 123.45
Enter expenses for month 10: 111.11
Enter expenses for month 11: 222.20
Enter expenses for month 12: 120.00
Month 1 = $100.00
Month 2 = $200.12
Month 3 = $150.50
Month 4 = $300.00
Month 5 = $100.50
Month 6 = $34.25
Month 7 = $45.75
Month 8 = $195.00
Month 9 = $123.45
Month 10 = $111.11
Month 11 = $222.20
Month 12 = $120.00
```

Exercise 2:
In this program youhave to average 10 persons' individual score using a single array and a single for loop. Your output should be as follows:
Output:

```
Enter Person 1's score: 95
Enter Person 2's score: 100
Enter Person 3's score: 60
Enter person 4'sscore: 100
Enter Person 5's score: 25
Enter Person 6's score: 0
Enter Person 7's score: 85
Enter Person 8's score: 85
Enter Person 9's score: 95
Enter Person 10's score: 85
The average score is 73
```

Exercise 3:
This program declares and initialize an array **a,** in which each element has the same value as its subscript. i.e. a[i] = i. Add another loop that will multiply all the even numbers in the array by 3. Add a third loop to display all the values in the array on one line with a single space between each value.
Output:

```
0 1 6 3 12 5 18 7 24 9
```

Exercise 4:
Write a program that declares an array **A** and inputs **n** integer values in **A**. Then the contents of array **A** is copied to another array **B** in reversed order. Finally print the elements of array **B**.
Output:

```
Input the size of the array A: 10
Input the values of A: 10 20 30 5 22 11 44 78 55 66
Array B: 66 55 78 44 11 22 5 30 20 10
```

Exercise 5:
The *Fibonacci numbers* are numbers of an interesting sequence in which each number is equal to the sum of the previous two numbers. In other words,

$$F_i = F_{i-1} + F_{i-2}$$

where F_i refers to the ith Fibonacci number. By definition 1st Fibonacci number is 0 and 2nd Fibonacci number is 1.

F_1 =0 and F2= 1

Hence,

$F_3 = F_2 + F_1 = 0 + 1 = 1$
$F_4 = F_3 + F_2 = 1 + 1 = 2$
$F_5 = F_4 + F_3 = 1 + 2 = 3$ and so on.

Write a C program that will generate first n Fibonacci numbers. Do the following steps:

1. Declare an array of 100 integer values without initializing the elements.
2. Use two assignment statements to set the first two elements to be equal to 0 and 1 respectively.

3. Use a loop to set the values of the remaining elements, so that (apart from the first two elements) each element in the array is equal to the sum of the previous two elements in the array.

Output:

```
How many Fibonacci numbers you want to generate: 15
The series is:  0  1  1  2  3  5  8  13  21  34  55  89  144  233  377
```

Exercise 6:

Write a program that will find the smallest number from a list of unsorted numbers. Do the following steps:

1. Declare an array **A** of 50 integers
2. Input **n** number of integer values in A
3. Search for the smallest value among these n values in array A.
4. Display the smallest value

Output:

```
Input number of elements in the array: 11
Input values: 1959      278      25      36      568      5      98      45      87      96
The SMALLEST value is: 5
```

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Lab- 8: String

Exercise 1:
Write a program that will take two strings as input and print them.

Exercise 2:
Write a program that will take one string and copy it into other string without using ***strcpy()***.

Exercise 3:
Write a program that will take two strings as input and concatenate them without using ***strcat().***

Exercise 4:
Write a program that will take two strings as input and find out their length without using ***strlen()***.

Exercise 5:
Find the frequency of a particular character in a string.

Exercise 6:
Input a string and print the reverse of it.

Assignments:

Problem 1:
Remove characters in a string except alphabets.

Problem 2:
Take a string input in lower case and convert it into upper case and print it.

Problem 3:
Take a string input in lower case and convert it into upper case and print it.

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Lab-6:C Functions

Exercise 1: A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself. Write a user define function to check a number whether it is prime or not. If the number is prime print “Prime” else print “Not Prime” and the minimum factor of it. Include your function in a working C program.

OUTPUT

```
Enter the number: 5
Prime
Enter the number: 9
Not Prime
Minimum factor is 3
```

Exercise 2: Write a C program to find the factorial of a given number with recursion. Write a user defined function for finding the factorial of n, using the formula n*fact(n-1).

OUTPUT:

```
Enter the number to find the factorial
5
The factorial of a number 5 using recursion is 120
```

Exercise 3: The *Fibonacci numbers* are numbers of an interesting sequence in which each number is equal to the sum of the previous two numbers. In other words,

$$F_i = F_{i-1} + F_{i-2}$$

where F_i refers to the ith Fibonacci number. By definition first two Fibonacci numbers is equal to 1; i.e.,

$$F_1 = 0$$
$$F_2 = 1$$

Hence,

$$F_3 = F_2 + F_1 = 0 + 1 = 1$$
$$F_4 = F_3 + F_2 = 1 + 1 = 2$$
$$F_5 = F_4 + F_3 = 2 + 1 = 3$$

and so on.

Write a C function that will generate first n Fibonacci numbers. Include your function in a working C program.

OUTPUT:

```
Enter the number: 7
First 7 Fibonacci numbers are: 1, 1, 2, 3, 5, 7 and 12
```

Exercise 4: Write a C function that calculates the value of weight **z** subject to the following conditions:

$$z = \begin{cases} x^2 - 4y & \mathit{if}\ x > y \\ x^2 + 4y & \mathit{if}\ x < y \\ (x+y)^{3/4} & \mathit{if}\ x = y \end{cases}$$

Then write a C main program that reads the values for **x** and **y** and calls the developed function for calculating the value of weight **z**.

OUTPUT:

```
Enter x: 3
Enter y: 5
Value of z is: 29
Enter x: 5
Enter y: 2
Value of z is: 17
```

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Lab-7: Function and Pointer

1. Write a short C program that declares and initializes (to any value you like) a double, an int, and a string. Your program should then print the address of, and value stored in, each of the variables. Use the format string "%p" to print the addresses in hexadecimal notation (base 16). You should see addresses that look something like this: "0xbfe55918". The initial characters "0x" tell you that hexadecimal notation is being used; the remainder of the digits give the address itself.

2. Write a C program to swap the values stored in two different variables. Write a function swap() to swap the elements.

3. Write a function with sample program which will take an array of integer, and the size of the array, and print the elements of array.

4. Write a C program that displays the average of the array values and a table of differences between each array element and the mean. Use a C function to find the average of the array elements.

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Lab- 9:Structure

1. Write a C program for the following: Declare a struct named **company**, which has members - **name** of type string, **income** of type float, and **cost** of type float. Using **company** declares an array of size 20 elements and write a program to read the information about all 20 companies. Finally print the profit made by each company in the array using the following formula
   profit = income – cost

2. Write a C program for the following: Declare a struct named **rectangle** which has threemembers: length, width and area of type float. Then create an arrayof ten rectangles prompting from the user the length and width of each rectangle. Next,compute the area of each rectangle in the list by calling a function named **area**. Finally print the length, width and area of each rectangle.

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Lab-10: Files

Exercise 1: Write a C program to copy one file into another. Create two text files named as input and output, where input file acts as a source file where the data to be copied is stored and the output file is the destination file for storing the copied data. Get the data from source file (opened in read mode) using gets function and copy the data to the destination file.

OUTPUT:

```
Enter the source file name to be copied:input.txt
Enter the destination file name:output.txt
Copy completed
Input.txt:
Good morning
Output.txt: (after copying)
Good Morning
```

Exercise 2: Write a C program that reads 10 integer values from an input file input.txt one by one and check whether the number is even or odd. If the number is even it stores it in a file called even.txt, otherwise if the number is odd it stores it in a file called odd.txt.

OUTPUT:

```
Data items in input file
  2     6     4     8     10    12    89    68    45    37
Data items in even.txt  file
2     6     4     8     10    12    68
Data items in odd.txt  file
89    45    37
```

Home Assignment

Problem 1:
Write a C program that reads the values in the elements of the 10-element array **A** and sorts the values into descending order. Use input and output files.

OUTPUT:

```
Data items in input file
  2    6     4     8     10    12    89    68    45    37
Data items in output file
89    68    45    37    12    10     8     6     4     2
```

Problem 2:
One student has sit for seven tests for a particular course. The final mark for that course is the average of six tests' marks (the lowest mark will be thrown out). Using two-dimensional array, input and output files, write a C program that calculates the final marks for 15 students who took that course.