1. **Write a program that prompts the user to enter the three sides of a box, check if the numbers are positive, and then compute the volume (الحجم).**

*Note: Volume=length*width*height*

Ex: Please insert three integer numbers: 6 10 8

The volume is 480

Ex: Please insert three integer numbers: 6 -10 8

Illegal input

Sample solution:

```cpp
/*
Q1) Write a program that prompts the user to
enter the three sides of a box,
check if the numbers are positive,
and then compute the volume (الحجم )
*/
#include<iostream>
using namespace std;
void main()
{
    double length, width, height, volume;
    cout<<"Please insert three integer number:";
    cin>>length>>width>>height;
    if(length>0 && width>0 && height>0)
    {
        volume=length * width * height;
        cout<<"\nThe volume is "<<volume<<endl;
    }
    else
        cout<<"\nIllegal Input\n";
}
```

2. Write a program that prompts the user to enter the base and height of a triangle (مثلث), check if the numbers are positive, and then compute the area.

Note: *Area=1/2*base*height*

Ex: Please insert the base and height of a triangle: 6 10

The area is 30

Ex: Please insert three integer numbers: 6 -10

Illegal input

Sample solution:

```cpp
/*
Q2) Write a program that prompts the user to
enter the base and height of a triangle (مثلث),
check if the numbers are positive,
and then compute the area.
*/
#include<iostream>
using namespace std;
void main()
{
    double base, height, Area;
    cout<<"Please insert the base and height of a
triangle:";
    cin>>base>>height;
    if(base>0 && height>0)
    {
        Area = 0.5 * base * height;
        //or Area = 1.0/2 * base * height;
        cout<<"\nThe area is "<<Area<<endl;
    }
    else
        cout<<"\nIllegal Input\n";
}
```

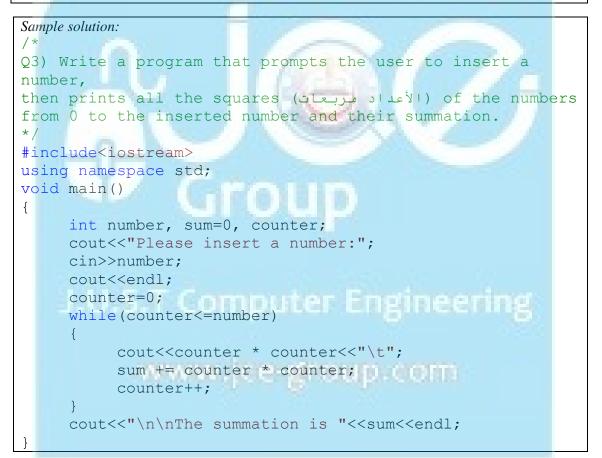**3.** **Write a program that prompts the user to insert a number, then prints all the squares (مربعات الأعداد) of the numbers from 0 to the inserted number and their summation.**

Note: Use any loop structure to solve the problem

Ex: Please insert a number: 3

0   1   4   9

The summation is 14

Sample solution:

```cpp
/*
Q3) Write a program that prompts the user to insert a
number,
then prints all the squares (الأعداد مربعات) of the numbers
from 0 to the inserted number and their summation.
*/
#include<iostream>
using namespace std;
void main()
{
    int number, sum=0, counter;
    cout<<"Please insert a number:";
    cin>>number;
    cout<<endl;
    counter=0;
    while(counter<=number)
    {
        cout<<counter * counter<<"\t";
        sum += counter * counter;
        counter++;
    }
    cout<<"\n\nThe summation is "<<sum<<endl;
}
```

4. Write a program that prompts the user to insert a number, and then prints the *Factorial* **(المضروب) of it.**

Note: *Use any loop structure to solve the problem*

Fact(x)=x*(x-1)*(x-2)*…*1

Fact(0)=Fact(1)=1 , No factorial for negative integers.

Ex: Please insert a number: 5

The Factorial of 5 is 120

Sample solution:

```cpp
/*
Q4) Write a program that prompts the user to insert a
number,
and then prints the Factorial (المضروب) of it.
*/
#include<iostream>
using namespace std;
void main()
{
    int number, fact=1, counter;
    cout<<"Please insert a number:";
    cin>>number;
    cout<<endl;
    counter=1;
    if(number>=0)
    {
        while(counter<=number)
        {
            fact*=counter;
            counter++;
        }
        cout<<"The Factroial of "<<number
            <<" is "<<fact<<endl;
    }
    else
        cout<<"No Factorial for negative values"<<endl;
}
```

5. **Write a program that prints the below menu, then asks the user if he/she wants to buy a meal (وجبة) or not (Y/N). If the user answers (Y) then he/she should choose the number of the meal. This process will be executed multiple times until the user insert (N). Then the program will compute his/her bill (الفاتورة).**

Ex:

The menu:

Meal 1: $2.26

Meal 2: $3.45

Meal 3: $6.80

Do you want to buy a Meal: Y

Choose a number between 1-3: 1

Do you want to buy a Meal: Y

Choose a number between 1-3: 3

Do you want to buy a Meal: Y

Choose a number between 1-3: 5

Do you want to buy a Meal: N

Your Bill is: $9.07 for 2 meals

Sample solution:
```
/*
Q5)  Write a program that prints the below menu,
then asks the user if he/she wants to buy a meal (وجبة)
or not (Y/N).
If the user answers (Y) then he/she should choose the
number of the meal.
This process will be executed multiple times
until the user insert (N).
Then the program will compute his/her bill (الفاتورة).
*/
#include<iostream>
using namespace std;
void main()
{
```

```cpp
    char buyornot;
    int mealno,counter=0;
    double bill=0;
    cout<<"The menu:\n"
        <<"Meal 1: $2.26\n"
        <<"Meal 2: $3.45\n"
        <<"Meal 3: $6.80\n";
    cout<<"\nDo you want to buy a Meal: ";
    cin>>buyornot;
    while( (buyornot!='N') && (buyornot!='n'))
    {
        if(buyornot=='Y' || buyornot=='y')
        {
            cout<<"\nChoose a number between 1-3: ";
            cin>>mealno;
            switch(mealno)
            {
            case 1:bill+=2.26; counter++; break;
            case 2:bill+=3.45; counter++; break;
            case 3:bill+=6.80; counter++; break;
            }
            cout<<"\nDo you want to buy a Meal: ";
            cin>>buyornot;
        }
        else
        {
            cout<<"\nDo you want to buy a Meal: ";
            cin>>buyornot;
        }
    }
    cout<<"\nYour Bill is: $"<<bill
        <<"  for "<<counter <<" meals\n";
}
```

6. Write a program that prompts the user to insert a positive integer number, then print a square of "@" symbols with a diagonal(قطر المربع) of "$" symbols. (Use nested loops)

Ex: Please insert an integer number: 5

```
$ @ @ @ @
@ $ @ @ @
@ @ $ @ @
@ @ @ $ @
@ @ @ @ $
```

Sample solution:
```cpp
/*
Q6)  Write a program that prompts the user to insert
a positive integer number, then print a square of "@"
symbols with a diagonal(المربع قطر) of "$" symbols. (Use
nested loops)
*/
#include<iostream>
using namespace std;
void main()
{
    int number, i, j;
    cout<<"Please insert an integer number:";
    cin>>number;
    cout<<endl;
    if(number>0)
        for(i=1;i<=number;i++)
        {
            for(j=1;j<=number;j++)
                if(i==j)
                    cout<<"$";
                else
                    cout<<"@";
            cout<<endl;
        }

    else
    cout<<"Illegal input\n";
}
```

7. **Write a program to convert the time from 24-hour notation to 12-hour notation and vice versa. Your program must show the following menu, to give the user the choice of converting the time between the two notations.**

Ex:

(1)Convert time from 24-hour notation to 12-hour notation

(2) Convert time from 12-hour notation to 24-hour notation

Please insert your choice: 1

Please insert the hour: 14

Please insert minutes: 5

Please insert seconds: 19

The Time is 02:05:19 PM

Ex:

(1)Convert time from 24-hour notation to 12-hour notation

(2) Convert time from 12-hour notation to 24-hour notation

Please insert your choice: 2

Please insert the hour: 4

Please insert minutes: 7

Please insert seconds: 3

Please insert A(for AM) or (P for PM): P

The Time is 16:07:03

Your program should check for invalid numbers

If the user tried to insert choice number 4→invalid input

If the user tried to insert the hour -35→invalid input

And so on for minutes and seconds.

Sample solution:

```cpp
/*
Q7) Write a program to convert the time from 24-hour notation
to 12-hour notation and vice versa.
Your program must show the following menu,
to give the user the choice of converting the time
between the two notations. */
#include<iostream>
using namespace std;
void main(){
    int choice,hours,minutes,seconds;char AMorPM;
    cout<<"(1)Convert time from 24-hour notation to 12-hour notation\n"
        <<"(2)Convert time from 12-hour notation to 24-hour notation\n";
    cin>>choice;  cout<<endl;
    switch(choice)
    {
    case 1://(1)Convert time from 24-hour notation to 12-hour notation
        cout<<"Please insert the hour:"; cin>>hours;
        if(hours>=0 && hours<=23)
        {
            cout<<"\nPlease insert minutes:"; cin>>minutes;
            if(minutes>=0 && minutes<60 )
            {
                cout<<"\nPlease insert seconds:"; cin>>seconds;
                if(seconds>=0 && seconds<60)
                {
                    //[0-11]-->AM [12-23]-->PM
                    cout<<"\nThe Time is ";
                    if(hours>=12){
                        AMorPM='P';
                        if(hours>12)
                            hours= hours-12;}
                    else{
                     AMorPM='A';
                     if(hours==0)
                            hours=12;
                    }
                    if(hours<10)
                        cout<<0;
                    cout<<hours<<":";
                    if(minutes<10)
                        cout<<0;
                    cout<<minutes<<":";
                    if(seconds<10)
                        cout<<0;
                    cout<<seconds;
                    if(AMorPM=='A')
                        cout<<" AM"<<endl;
                    else
                        cout<<" PM"<<endl;
                }
                else
```

```cpp
                    cout<<"invalid input\n";
            }
            else
                cout<<"invalid input\n";
        }
        else
            cout<<"invalid input\n";
        break;
    case 2://(2)Convert time from 12-hour notation to 24-hour notation
        cout<<"Please insert the hour:"; cin>>hours;
        if(hours>0 && hours<=12)
        {
            cout<<"\nPlease insert minutes:"; cin>>minutes;
            if(minutes>=0 && minutes<60 )
            {
                cout<<"\nPlease insert seconds:"; cin>>seconds;
                if(seconds>=0 && seconds<60)
                {
                    cout<<"\nPlease insert A(for AM) or (P for PM):";
                 cin>>AMorPM;
                    //[0-11]-->AM [12-23]-->PM
                    if(AMorPM=='P')
                        hours+=12;
                    else if(hours==12)//Midnight:0(in 24hrs)=12AM(in 12hrs)
                        hours=0;
                    if(AMorPM=='P' || AMorPM=='A')
                    {
                        cout<<"\nThe Time is ";
                        if(hours<10)
                            cout<<0;
                        cout<<hours<<":";
                        if(minutes<10)
                            cout<<0;
                        cout<<minutes<<":";
                        if(seconds<10)
                            cout<<0;
                        cout<<seconds<<endl;
                    }
                    else
                        cout<<"invalid input\n";
                }
                else
                    cout<<"invalid input\n";
            }
            else
                cout<<"invalid input\n";
        }
        else
            cout<<"invalid input\n";
        break;
    default:cout<<"invalid input\n";
    }
}
```

8. Write a C++ Program which will calculate the following formula, then print the result.

$$Sum = \frac{A+5B}{2} + 4\pi, \pi = 3.14$$

Make sure that A≠2, and B should be a positive number
Otherwise the program should display the message INCORRECT VALUES.
You should use *switch structure* to solve the problem.

Sample solution:

```cpp
/*
Q8)  Write a C++ Program which will calculate the
following formula,
then print the result.
Sum =  (A+5B)/2 + 4π , π=3.14
Make sure that A≠2, and B should be a positive number
Otherwise the program should display the message
INCORRECT VALUES.
You should use switch structure to solve the problem.
*/
#include<iostream>
using namespace std;
void main()
{
    const double PI=3.14;
    double sum, A,B;
    cout<<"Please insert two positive numbers:";
    cin>>A>>B;
    cout<<endl;
    switch(A!=2 && B>=0 && A>=0)
    {
    case true:
        sum=(A+5*B)/2 + (4*PI);
        cout<<"Sum:"<<sum<<endl;
        break;
    case false:
        cout<<"INCORRECT VALUES\n";
    }
}
```

9. Write a C++ program which will ask the user to give three integers (X, Y, and Z), and then it will display integers between (X*Y) and (Y/X) in reverse order according to step value Z.

```
Enter First integer(X) :2
Enter Second integer(Y) :5
Enter Third integer(Z) :3
**********************
10 7 4
**********************
```

```
Enter First integer(X) :15
Enter Second integer(Y) :3
Enter Third integer(Z) :4
**********************
TRY AGAIN
**********************
```

Notes:

- X should be less than or equal to Y, otherwise display TRY AGAIN.
- You should use *for loop* to solve the problem.

Sample solution:
```cpp
/*
Q9) Write a C++ program which will ask the user
to give three integers (X, Y, and Z),
and then it will display integers
between (X*Y) and (Y/X)
in reverse order according to step value Z.
*/
#include<iostream>
using namespace std;
void main()
{
    int X, Y, Z,i;
    cout<<"Enter First integer(X) :";
    cin>>X;
    cout<<"Enter Second integer(Y) :";
    cin>>Y;
    cout<<"Enter Third integer(Z) :";
    cin>>Z;
    cout<<"**********************\n";
    if(X<=Y)
        for(i=X*Y;i>=Y/X;i=i-Z)
            cout<<i<<" ";
    else
        cout<<"TRY AGAIN ";

    cout<<"\n**********************\n";
}
```

10. Write a C++ program to find the weekly salary of a company's workers according to the following:

- If the worker works less than or equal to 30 hours per week he will get 10 JDs for each hour.
- If the worker works greater than 30 hours per week he will get 10 JDs for the first 30 hours and 14 JDs for each hour after the 30th hour.
- The number of workers is unknown, and the input will continue until the user enters -5 to stop.

You should use *do while loop,* with *any selection structure* to solve the problem.

Sample solution:

```cpp
/*Q10) Write a C++ program to find the weekly salary
    of a company's workers according to the following:
  •    If the worker works less than or equal to 30 hours
       per week he will get 10 JDs for each hour.
  •    If the worker works greater than 30 hours per week
       he will get 10 JDs for the first 30 hours and 14 JDs
       for each hour after the 30th hour.
  •    The number of workers is unknown, and the input will
       continue until the user enters -5 to stop.
You should use do while loop, with any selection structure to
solve the problem.*/
#include<iostream>
using namespace std;
void main(){
    double salary; int workers,hours,noOfWorkers=0;
    do
    {    if(noOfWorkers>0)
        {
            cout<<"Enter the number of hours:";
            cin>>hours;
            cout<<endl;
            if(hours<=30)
                salary=hours*10;
            else//hours>30
                salary=30*10+14*(hours-30);
            cout<<"The salary of worker "<<noOfWorkers
                <<" is:"<<salary<<endl<<endl;
            cout<<"*******************************\n";
        }
cout<<"If there are more workers enter any integer (-5 to stop):";
cin>>workers; cout<<endl;
noOfWorkers++;
}while(workers!=-5);
}
```