CLASSWORK APPLICATIONS FOR LOOPS

Q1. Write a program that determines all the numbers of multiples of nine between 0 and 1000.

```
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5    int main(){
6        double i=0;
7    do{
8        cout<<i<<endl;
9        i+=9;
10   }while(i<=1000);
11   }
```

```
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5    int main(){
6    for(int i=0;i<=1000;i+=9){
7        cout<<i<<endl;
8    }
9    }
```

```
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5    int main(){
6        int i=0;
7    while(i<=1000){
8        cout<<i<<endl;
9        i=i+9;
10   }
11   }
```

Q2. Write a program that determines all the numbers that can be exactly divided both 3 and 4 between 0 and 1000.

```
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5    int main(){
6        int i=0;
7    while(i<=1000){
8        if(i%3==0 && i%4==0){
9        cout<<i<<endl;}
10       i++;
11   }
12   }
```
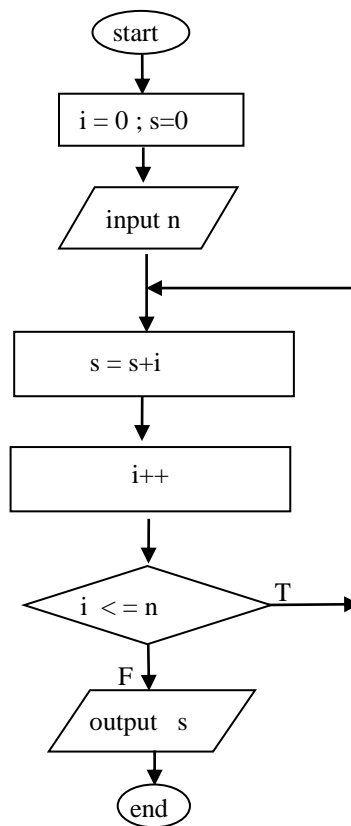
Q3. Write C++ program to obtain following list:

 1-2-4-8-16-32-...........-131072

```
1   #include<iostream>
2   #include<cmath>
3   using namespace std;
4
5   int main(){
6   for(int i=1;i<=131072;i=i*2){
7       cout<<i<<" ";
8   }
9   }
```

Q4. Implement the flow chart (below) in a C++ program. All variables should be type "double".

```
                        start

                      i = 0 ; s=0

                       input n

                        s = s+i

                         i++

                 i < = n          T

                    F
                    output  s

                        end
```

```
1   #include<iostream>
2   #include<cmath>
3   using namespace std;
4
5   int main(){
6   double n,i=0,s=0;
7   cout<<"Input n: \n";
8   cin>>n;
9   do{
10      s=s+i;
11      i++;
12  }while(i<=n);
13  cout<<s;
14  }
```

Q5. Write a computer program to show that the following series sum is equal to zero.

$$\sum_{K=1}^{\infty} \frac{1}{K(K+1)}$$

Hints: Use double for all your variables. You will need to calculate many terms; check your program first with 100 terms then 10000, and then 1000000 terms; you should find that the accuracy increases as the number of terms increase.

```cpp
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5    int main(){
6        double n,k=1,s=0;
7        cout<<"Input n: \n";
8        cin>>n;
9        do{
10            s=s+1/(k*(k+1));
11            k++;
12       }while(k<=n);
13       cout<<s;
14   }
```

Q6. Write a program that calculates the end deflection of the beam while the load changes from zero to 10kN with an increment of 0.5 kN.

L=1 m
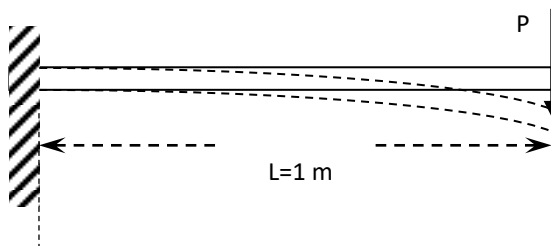
$$y = -\frac{PL^3}{3EI}$$

where E = 210*10^9 Pa

I = 8.333*10^{-5} m^4

P is vertical end load

L is length of beam

```
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5 ╒ int main(){
6    double y,P=0,L=1,E=210E9,I=8.333E-5;
7
8 ╒ do{
9        y=-P*L*L*L/(3*E*I);
10       cout<<"y= "<<y<<" under "<<P<<" kN."<<endl;
11       P=P+0.5;
12   }while(P<=10);
13
14   }
```

```
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5 ╒ int main(){
6    double y,L=1,E=210E9,I=8.333E-5;
7
8 ╒ for(double P=0;P<=10;P+=0.5){
9        y=-P*L*L*L/(3*E*I);
10       cout<<"y= "<<y<<" under "<<P<<" kN."<<endl;
11       }
12
13   }
```

Q7. A particle moves along the x-axis with an initial velocity v=50 m/s. The x position of this particle can be defined using following equations.

$$x=v*t \qquad\qquad 0\leq t \leq 4\sec$$
$$x=-5*t^2+90*t-80 \qquad\qquad 4< t \leq 9\sec$$

Write a program to find the position x of particle in steps of 0.1 seconds for the interval $0 \leq t \leq 9$ seconds.

```
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5 ╒ int main(){
6    double V=50,t=0,x;
7
8 ╒ do{
9        if(t>=0 && t<=4){
10       x=V*t;}
11       else if(4<t && t<=9)
12       x=-5*t*t+90*t-80;
13       cout<<"x= "<<x<<" at "<<t<<" sec"<<endl;
14       t=t+0.1;
15       } while(t<=9);
16   }
```

Q8. Write a program to calculate the following function for x between -5 and 5 with 0.1 increments.

$$f(x) = \frac{\sqrt{16 - x^2}}{x + 3}$$

```cpp
1   #include<iostream>
2   #include<cmath>
3   using namespace std;
4
5   int main(){
6   double f=0,x=-5;
7
8   do{
9       f=sqrt(16-x*x)/(x+3);
10      cout<<"f("<<x<<")= "<<f<<endl;
11      x=x+0.1;
12      } while(x<=5);
13  }
```

**Q9.** Write a program to obtain the following output using nested loops.

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

```cpp
1   #include<iostream>
2   #include<cmath>
3   using namespace std;
4
5   int main(){
6
7       for(int i=1; i<=7; i++){
8           for(int j=1; j<=i;j++){
9           cout<<"*";}
10          cout<<endl;}
11      for(int i=6; i>=1; i--){
12          for(int j=1; j<=i; j++){
13          cout<<"*";}
14          cout<<endl;}
15  }
```

Q10. Write a program that determines the deflection of simply supported beam at points 0, 0.1, 0.2, 0.3 ... 2 m. The program also displays the maximum deflection.
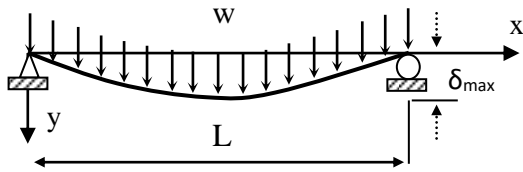

$$y = \frac{wx}{24EI}(l^3 - 2lx^2 + x^3)$$

Where $w = 200\ N/m$
           L=2 m
           E=200 GPa
           I=1.2* 10^{-6} m^4.

Q11. Write a program that determines the horizontal and vertical position of a particle when the time changes between 0 and 20 seconds with an increment of 0.5. It is thrown with an initial velocity of 50 m/s and with an initial angle of 60° with horizontal axis. The program also displays the maximum height that can be reached by object.

Hint:

The horizontal position $x = V_0\ Cos\theta\ t$
The vertical position $y = V_0\ Sin\theta\ t - \frac{1}{2}g\ t^2$
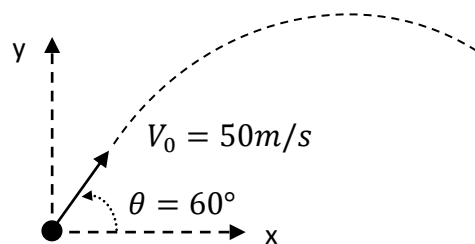
Q12. Write a program that calculates the square root of a given number. Program repeats the calculation until the user want to stop. Also the program should not attemp to calculate the square roots of negative numbers.

```cpp
1   #include<iostream>
2   #include<cmath>
3   using namespace std;
4   int main(){
5   int n;
6   char ans;
7   while(1){
8       cout<<"enter a number: "<<endl;
9       cin>>n;
10      if(n>=0){
11      cout<<"square root="<<sqrt(n)<<endl;
12      }
13      else {
14          cout<<"enter positive number!"<<endl;
15          continue;
16      }
17      cout<<"Do you want to continue? y/n"<<endl;
18      cin>>ans;
19      if(ans=='n'|| ans=='N') {
20      cout<<"BYE!!";
21      break;}
22      else continue;
23
24  }
25      }
```

```cpp
1    #include<iostream>
2    #include<cmath>
3    using namespace std;
4
5    int main(){
6        double n;
7        char answer;
8        do{
9        cout<<"enter a number: \n";
10       cin>>n;
11       if (n>=0) cout<<"Square root of "<<n<<" is "<<sqrt(n)<<endl;
12       else      cout<<"Enter a positive number!!\n";
13
14       cout<<"Would you want to enter a new number?: y or n "<<endl
15       cin>>answer;
16       if (answer=='n'|| answer=='N') break;
17       else continue;
18       }while(1);
19
20   }
```