Department of Computer Science and Engineering

.

Course Code : CSE- 4746

Course Title : Numerical Methods Lab

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- **Write a program to count number of significant digits in a given number.**

Source Code:

```
#include<bits/stdc++.h>
using namespace std;

bool check_integer(string s)
{
    for(int i=0;i<s.size();i++)
    {
        if(s[i]=='.')return 0;
    }
    return 1;
}

int main()
{
    int sum = 0,sum1 = 0;
    int f = 1 , c = 1;
    string s;
    cin>>s;

    if(check_integer(s))
    {
        for(int i=s.size();i>=0;i--)
        {
            if(s[i]>'0') c = 0;
            if(!c)sum++;
        }
        cout<<sum<<endl;
    }

    else{
        for( int i=0;i<s.size();i++)
        {
```

```
            if(s[i]=='.')f = 0;
            else if(f && s[i]>'0')sum++;
            else if(f && s[i]=='0'&&sum>0)sum++;
            else if(!f && sum>0)sum++;
            else if(!f && sum==0 && s[i]!='0')sum1++;
            else if(!f && sum==0 && sum1>0)sum1++;
        }

        cout<<sum+sum1<<endl;
    }
    return 0;
}
```

- **Write a program to round off a number with n significant figures using banker's rule.**

Source Code:

```
// bijoy
// id:c201016
// Write a program to round off a number with n digits after the
decimal point using the banker's rule

#include <bits/stdc++.h>
using namespace std;

int main()
{
  string number;
  string output = "";
  int n, count, m;
  cout << "enter the number: ";
  getline(cin, number);
  m = number.size();

  cout << "enter the n: ";
  cin >> n;
  count = 0;
```

```
for (int i = 0; i < m; i++)
{

  if (count == n + 1)
  {
    if ((number[i + 1] - '0') > 5)
    {
      output += (number[i] + 1);
      cout << "a";
      break;
    }
    else if ((number[i + 1] - '0') < 5)
    {

      output += number[i];
      break;
    }
    else if ((number[i + 1] - '0') == 5)
    {
      if ((number[i] - '0') % 2 == 0)
      {

        output += number[i];
      }
      else

        output += (number[i] + 1);

      break;
    }

    else
    {
      output += number[i];
    }
  }
  else
  {
    output += number[i];
```

```
    }
    count++;
  }
  cout << "Output: " << output << endl;

  return 0;
}
```

- **Write a program to evaluate a polynomial f(x) = x 3 - 2x 2 + 5x + 10 by using Horner's rule x = 5.**

  Source code:

```
#include <bits/stdc++.h>
using namespace std;

int main()
{
  int poly[] = {1, -2, 5, 10};
  int x = 5;
  int n = sizeof(poly) / sizeof(poly[0]);

  int result = poly[0];
  for (int i = 1; i < n; i++)
  {
    result = result * x + poly[i];
  }
  cout << "polynomial is " << result << endl;
}
```

- **Write a program to find the root of the equation $x^2 - 9x + 1 = 0$, correct to 3 decimal places, by using the bisection method.**

  Source Code:

```
// id:c201016
// Write a program to find the root of the equation x3 - 9x + 1 = 0,
correct to 3 decimal places, by using the bisection method.


#include<bits/stdc++.h>
using namespace std;
```

```
double fun(double a){
    return a*a*a-9*a+1;
}
void bisection(double a, double b)
{
    if((fun(a)*fun(b))>0){
        cout<<"it is not possible for these value"<<endl;
    }
    double c = a;
    while((b-a)>=0.001)
    {
        c=(a+b)/2;
        if(fun(c)==0.0)
        break;
        if(fun(c)* fun(a)>0)
        a=c;
        else
        b=c;

    }
    cout<<"the root is "<<c;
}
int main()
{

    double a =0, b = 1;
    bisection(a,b);
}
```

- **Write a program to find the root of the equation $x^5 + 3x^2 - 10 = 0$, correct to 3 decimal places, by the using fixed point method.**

  Source Code:

```
#include<bits/stdc++.h>
using namespace std;
#define E 0.0001;
#define f(x) ((x*x*x*x*x)+(3*(x*x))-10)
#define g(x) (sqrt(10/(pow(x,3.0)+3)))
```

```
int main()
{
    double x0,x1;
    x0=0.5;
    while(1){

       x1= g(x0);
       double error=x1-x0;
       if(fabs(error)<0.001)
       {
        cout<<"the root is "<<x1<<endl;
       break;
       }
       else
       x0=x1;

    }

}
```

- **Write a program to find the root of the equation $x^3 - 6x + 4 = 0$, correct to 3 decimal places, by using Newton-Raphson method.**
  <u>Source Code</u>:

```
#include<bits/stdc++.h>
using namespace std;
#define E 0.0001;
#define f(x) (pow(x,3)-6*x+4)
#define ff(x) ((3*pow(x,2))-6)
int main()
{
    double x0,x1;
    x0=0.5;
do{
    double ff_0=ff(x0);
    double f_0=f(x0);
    x1=(x0-(f_0/ff_0));
    if(fabs(x1-x0)<0.001)
    {
```

```
        cout<<"the root is "<<x1<<endl;
        break;
    }
    else
    x0=x1;

}while (1);}
```

- **Write a program to find the root of the equation x 3 - x + 2 = 0, correct to 3 decimal places, by using false position method.**

  Source Code

- **Write a program to find the root of the equation $x^3 - 5x^2 - 29 = 0$, correct to 3 decimal places, by using secant method.**

Source Code:

```
#include<bits/stdc++.h>
using namespace std;
#define E 0.0001;
#define f(x) (pow(x,3)-(5*pow(x,2))-29)
#define ff(x) ((3*pow(x,2))-6)
int main()
{
    double x0=4;
    double x1=2;

do{
    double f_x0= f(x0);
    double f_x1 = f(x1);
    double x2= (x1-(((x1-x0)*f_x1)/(f_x1-f_x0)));
    if(fabs(x2-x1)<0.0001)
    {
        cout<<"the root is "<<x2<<endl;
        break;
```

```
    }
    else
    x0=x1;
    x1=x2;

}while (1);


}
```

- **Write a program to find the quotient polynomial q(x) such that p(x) = (x - 2) q(x) where the polynomial $p(x) = x^3 - 5x^2 + 10x - 8 = 0$ has a root at x = 2.**

  <u>Source Code</u>:

- **Write a program to find all the roots of the equation $x^3 - 6x + 4 = 0$, correct to 3 decimal places.**

  Source Code: