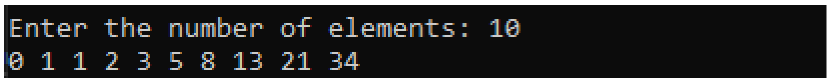
1.Write a C# program to print Fibonacci series using Recursion and without using Recursion.

```
using System;
namespace Exercises
{
class Fibonacci
{
    public static void Main(string[] args)
    {
        int n1 = 0, n2 = 1, n3, i, number;
        Console.Write("Enter the number of elements:");
        number = int.Parse(Console.ReadLine());
        Console.Write(n1 + " " + n2 + " ");

        for(i=2;i<number;++i)
        {
            n3 = n1 + n2;
            Console.Write(n3 + " ");
            n1 = n2;
            n2 = n3;
        }
    }
}
}
```

OUTPUT:

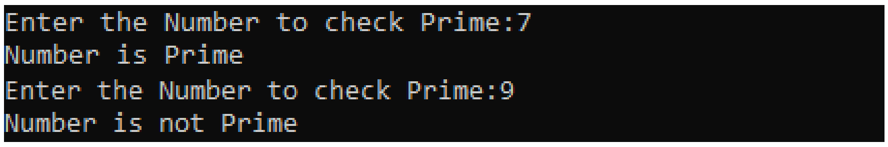


```
Enter the number of elements: 10
0 1 1 2 3 5 8 13 21 34
```

2.Write a C# program to check whether the given number is Prime or not.

```
using System;
namespace Exercises
{
class Primenumber
{
    static void Main(string[] args)
    {
        int n, i, m = 0, flag = 0;
        Console.Write("Enter the Number to check Prime:");
        n = int.Parse(Console.ReadLine());
        m = n / 2;

        for(i=2;i<=m;i++)
        {
            if(n%i==0)
            {
                Console.Write("Number is not Prime");
                flag = 1;
                break;
            }
        }
        if (flag == 0)
            Console.Write("number is Prime");
    }
}
}
```

OUTPUT:

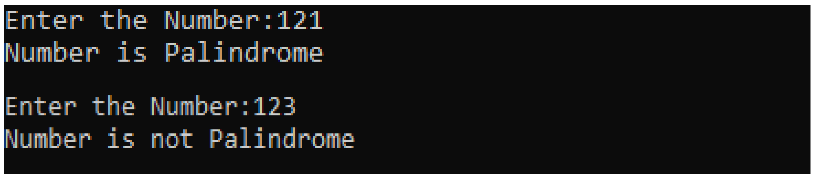


```
Enter the Number to check Prime:7
Number is Prime
Enter the Number to check Prime:9
Number is not Prime
```

3.Write a C# program to check whether the given element is Palindrome or not.

```
using System;
namespace Exercises
{
class Palindrome
{
    static void Main(string[] args)
    {
        int n, r, sum = 0, temp;
        Console.Write("Enter the Number:");
        n = int.Parse(Console.ReadLine());
        temp = n;
        while(n>0)
        {
            r = n % 10;
            sum = (sum * 10) + r;
            n = n / 10;
        }
        if (temp == sum)
            Console.WriteLine("Number is Palindrome");
        else
            Console.WriteLine("Number is not Palindrome");
    }
}
}
```

OUTPUT:

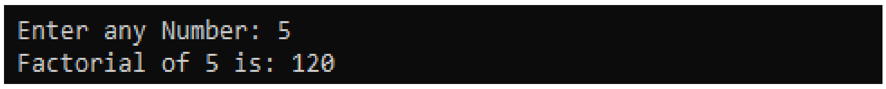


```
Enter the Number:121
Number is Palindrome

Enter the Number:123
Number is not Palindrome
```

4.Write a C# program to print factorial of a number.

```
using System;
namespace Exercises
{
class Factorial
{
    static void Main(string[] args)
    {
        int i, fact = 1, number;
        Console.WriteLine("Enter any Number:");
        number = int.Parse(Console.ReadLine());
        for(i=1;i<=number;i++)
        {
            fact = fact * i;
        }
        Console.Write("Factorial of" + number + "is:" + fact);
    }
}
}
```

OUTPUT:

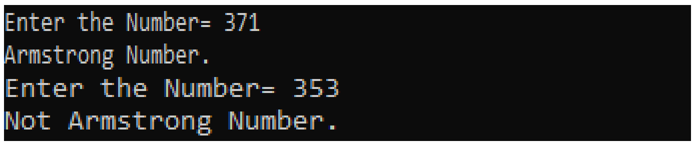


```
Enter any Number: 5
Factorial of 5 is: 120
```

5.Write a C# program to check whether the given element is Armstrong or not.

```
using System;
namespace Exercises
{
class Armstrong
{
    static void Main(string[] args)
    {
        int n, r, sum = 0, temp;
        Console.Write("Enter the Number= ");
        n = int.Parse(Console.ReadLine());
        temp = n;
        while (n > 0)
        {
            r = n % 10;
            sum = sum + (r * r * r);
            n = n / 10;
        }
        if (temp == sum)
            Console.Write("Armstrong Number.");
        else
            Console.Write("Not Armstrong Number.");
    }
}
}
```

OUTPUT:

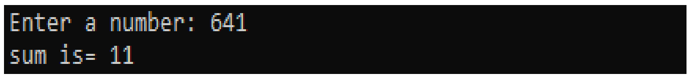


```
Enter the Number= 371
Armstrong Number.
Enter the Number= 353
Not Armstrong Number.
```

6.Write a C# program to find the sum of Digits.

```
using System;
namespace Exercises
{
class sum
{
    static void Main(string[] args)
    {
        int n, sum = 0, m;
        Console.WriteLine("Enter a number:");
        n = int.Parse(Console.ReadLine());
        while(n>0)
        {
            m = n % 10;
            sum = sum + m;
            n = n / 10;
        }
        Console.Write("sum is=" + sum);
    }
}
}
```

OUTPUT:

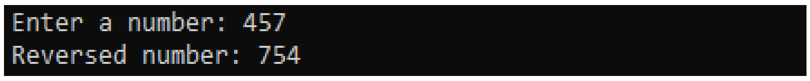


```
Enter a number: 641
sum is= 11
```

7.Write a C# program to Reverse a given number.

```
using System;
namespace Exercises
{
class Reverse
{
    static void Main(string[] args)
    {
        int n, reverse = 0, rem;
        Console.Write("Enter a number:");
        n = int.Parse(Console.ReadLine());
        while(n!=0)
        {
            rem = n % 10;
            reverse = reverse * 10 + rem;
            n /=10;
        }
        Console.Write("Reversed Number:" + reverse);
    }
}
}
```

OUTPUT:

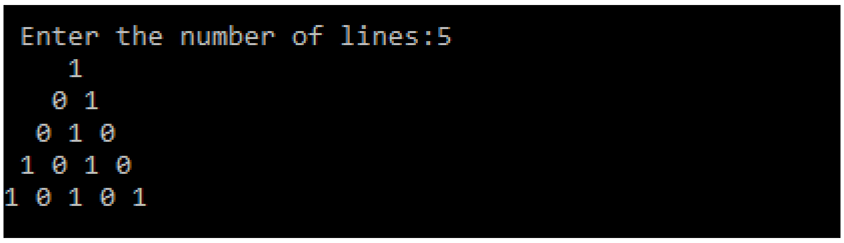


```
Enter a number: 457
Reversed number: 754
```

8.C# program to print a binary triangle.

```
using System;
namespace Exercises
{
class Binarytriangle
{

    static void Main(string[] args)
    {
        int number, digit = 1;
        Console.Write("Enter the number of lines:");
        number = Convert.ToInt32(Console.ReadLine());

        for(int i=1; i<=number;i++)
        {
            for(int space=number-i;space>0;space--)
            {
                Console.Write(" ");
            }
            for(int j=0;j<i;j++)
            {
                Console.Write(digit + " ");
                digit = (digit == 1) ? 0 : 1;
            }
            Console.Write("\n");
        }
    }
}
}
```

OUTPUT:

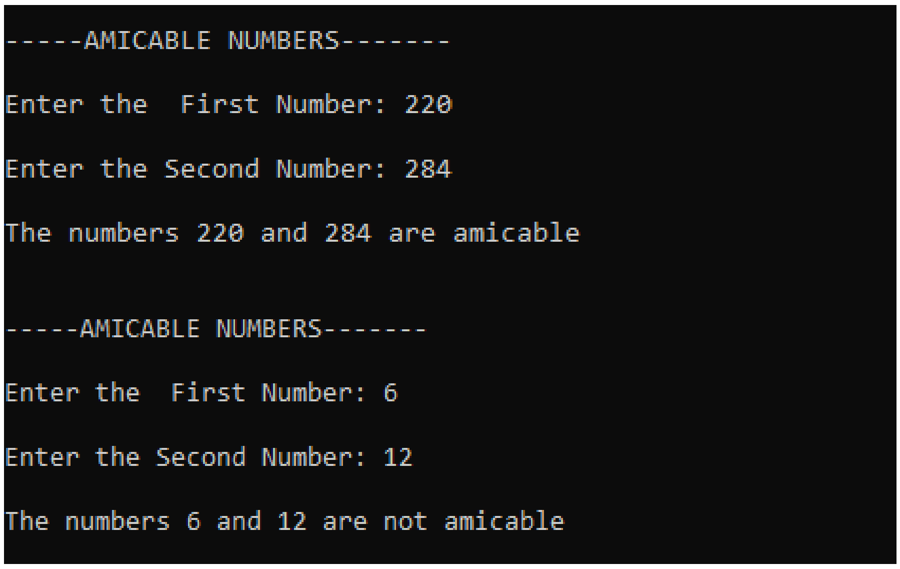


```
 Enter the number of lines:5
    1
   0 1
  0 1 0
 1 0 1 0
1 0 1 0 1
```

9.C# program to check whether the entered number is an Amicable Number or Not.

```
using System;
namespace AmicableNumber
{
class AmicableNumber
{
   static void Main(String[] args)
   {
      int num1, num2, sum1 = 0, sum2 = 0;
      Console.WriteLine("\n -----AMICABLE NUMBERS-------\n");
      Console.Write("\nEnter the  First Number : ");
      num1 =Convert.ToInt32(Console.ReadLine());
      Console.Write("\nEnter the  Second Number : ");
      num2 = Convert.ToInt32(Console.ReadLine());

      for(int i=1;i<num1;i++)
      {
         if (num1%i == 0)
         {
            sum1 += i;
         }
      }
      for (int i=1;i<num2;i++)
      {
         if (num2 % i == 0)
         {
            sum2 += i;
         }
      }
      if (sum1 == num2 && sum2 == num1)
      {
         Console.WriteLine("\nThe numbers{0} and {1} are amicable", num1,num2);
      }
      else
      {
         Console.WriteLine("\nThe numbers{0} and {1} are not amicable", num1, num2);
      }
   }
}
}
```

OUTPUT:



```
-----AMICABLE NUMBERS-------

Enter the  First Number: 220

Enter the Second Number: 284

The numbers 220 and 284 are amicable


-----AMICABLE NUMBERS-------

Enter the  First Number: 6

Enter the Second Number: 12

The numbers 6 and 12 are not amicable
```

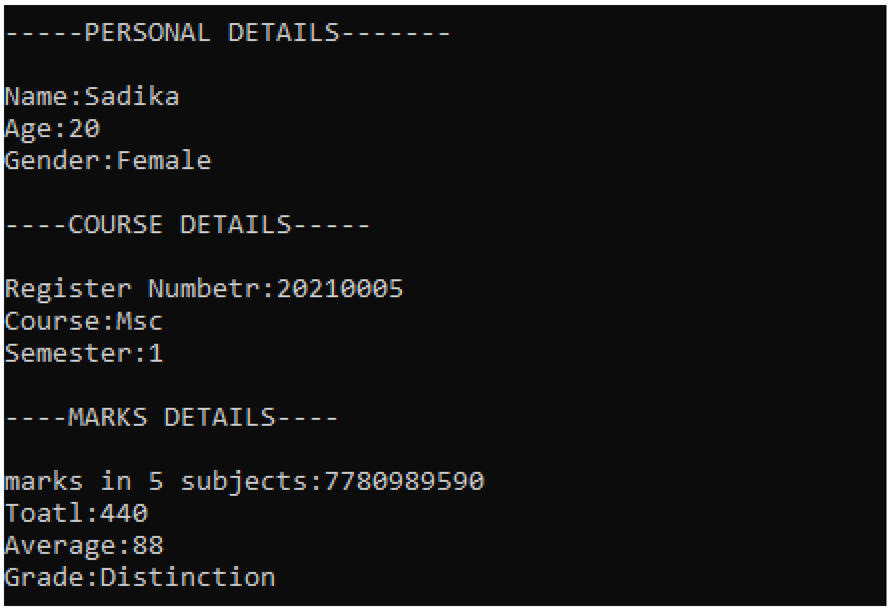
10.C# program to Illustrate Multilevel Inheritance with visrtual Methods(displaying student details).

```
using System;
namespace Excercises
{
class PersonalDetails
{
   string name;
   int age;
   string gender;
   public PersonalDetails(string name, int age, string gender)
   {
      this.name = name;
      this.age = age;
      this.gender = gender;
   }
   public virtual void Display()
   {
      Console.WriteLine("\n-----PERSONAL DETAILS-------\n");
      Console.WriteLine("Name:" + name);
      Console.WriteLine("Age:" + age);
      Console.WriteLine("Gender:" + gender);
   }

}
class CourseDetails : PersonalDetails
{
   int regNo;
   string course;
   int semester;
   public CourseDetails(string name, int age, string gender, int regNo, string course, int
semester) : base(name, age, gender)
   {
      this.regNo = regNo;
      this.course = course;
      this.semester = semester;
   }
   public override void Display()
   {
      base.Display();
      Console.WriteLine("\n----COURSE DETAILS-----\n");
      Console.WriteLine("Register Numbetr:" + regNo);
      Console.WriteLine("Course:" + course);
      Console.WriteLine("Semester:" + semester);
   }
}
class MarksDetails : CourseDetails
{
   int[] marks = new int[5];
```

```
    int total;
    float average;
    string grade;
    int flagFail;
    public MarksDetails(string name, int age, string gender, int regNo, string course, int
semester, int[] marks) : base(name, age, gender, regNo, course, semester)
    {
        total = 0;
        for (int i = 0; i < 5; i++)
        {
            this.marks[i] = marks[i];
            total += marks[i];
            if (marks[i] < 35)
            {
                flagFail = 1;
            }
        }
        Calculate();
    }
    private void Calculate()
    {
        average = total / 5;
        if (flagFail == 1 || average < 40)
            grade = "Fail";
        else if (average >= 70)
            grade = "Distinction";
        else if (average >= 60)
            grade = "Firstclass";
        else if (average >= 50)
            grade = "second class";
        else
            grade = "Pass class";

    }
    public override void Display()
    {
        base.Display();
        Console.WriteLine("\n----MARKS DETAILS----\n");
        Console.Write("marks in 5 subjects:");
        for (int i = 0; i < 5; i++)
            Console.Write(marks[i] + "");
        Console.WriteLine();
        Console.WriteLine("Toatl:" + total);
        Console.WriteLine("Average:" + average);
        Console.WriteLine("Grade:" + grade);

    }
}
```

```
class Multilevel
{
    public static void Main(string[] args)
    {
        MarksDetails Student1 = new MarksDetails("Sadika", 20, "Female", 20210005, "Msc", 1,
new int[] { 77, 80, 98, 95, 90 });
        Student1.Display();
    }
}
}
```

OUTPUT:

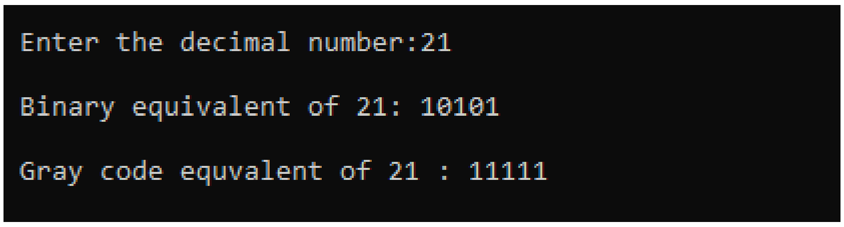


```
-----PERSONAL DETAILS-------

Name:Sadika
Age:20
Gender:Female

----COURSE DETAILS-----

Register Numbetr:20210005
Course:Msc
Semester:1

----MARKS DETAILS----

marks in 5 subjects:7780989590
Toatl:440
Average:88
Grade:Distinction
```

11.C# program to create a Gray code.

```
using System;
namespace Exercises
{
class Graycode
{
    static int getGray(int n)
    {
        return n ^ (n >> 1);
    }
    static void Main(string[] args)
    {
        int InputNum, GrayNum;
        Console.Write("\n Enter the decimal number:");
        InputNum = Convert.ToInt32(Console.ReadLine());
        Console.WriteLine("\n Binary equivalent of {0}: {1}", InputNum,
Convert.ToString(InputNum, 2));
        GrayNum = getGray(InputNum);
        Console.WriteLine("\n Gray code equvalent of {0} : {1}", InputNum,
Convert.ToString(GrayNum, 2));
    }

}
}
```

OUTPUT:

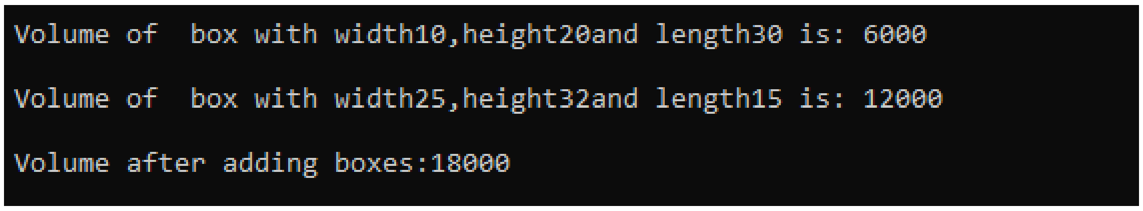


```
Enter the decimal number:21

Binary equivalent of 21: 10101

Gray code equvalent of 21 : 11111
```

12.C# program to calculate volume of 2 boxes and find the resultant volume after addition of 2 boxes by implementing operator overloading.

```
using System;
namespace Exercises
{
class Box
{
   float width;
   float height;
   float length;
   public float Volume
   {
      get { return width * height * length; }
   }
   public Box(float width,float height,float length)
   {
      this.width = width;
      this.height = height;
      this.length = height;
   }
   public static float operator+(Box box1,Box box2)
   {
      return box1.Volume + box2.Volume;
   }
   public override String ToString()
   {
      return " box with width"+width+",height" + height + "and length" + length;
   }
   }
class OperatorOverloading
{
   public static void Main()
   {
      Box box1 = new Box(10, 20, 30);
      Box box2 = new Box(25, 32, 15);
      Console.WriteLine("Volume of {0} is: {1}", box1, box1.Volume);
      Console.WriteLine("Volume of {0} is: {1}", box2, box2.Volume);
      Console.WriteLine("Volume after adding boxes: {0}",box1+box2);
   }
}
}
```

OUTPUT:

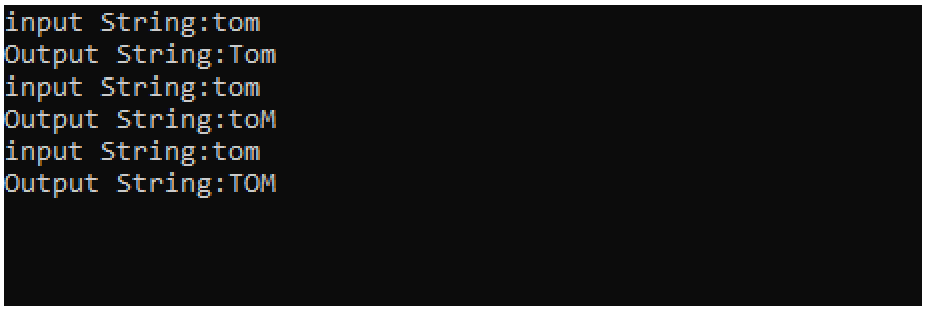


```
Volume of  box with width10,height20and length30 is: 6000

Volume of  box with width25,height32and length15 is: 12000

Volume after adding boxes:18000
```

13.C# program to implement principle of Delegates(Converting input string to uppercase first, last and entire string).

```
using System;
namespace Exercises
{
class Delegates
{
   delegate string UppercaseDelegate(string input);
   static string UppercaseFirst(string input)
   {
      char[] buffer = input.ToCharArray();
      buffer[0] = char.ToUpper(buffer[0]);
      return new string(buffer);
   }
   static string UppercaseLast(string input)
   {
      char[] buffer = input.ToCharArray();
      buffer[buffer.Length-1] = char.ToUpper(buffer[buffer.Length-1]);
      return new string(buffer);
   }
   static string UppercaseAll(string input)
   {
      return input.ToUpper();
   }
   static void WriteOutput(string input, UppercaseDelegate del)
   {
      Console.WriteLine("input String:{0}", input);
      Console.WriteLine("Output String:{0}", del(input));
   }
   static void Main()
   {
      WriteOutput("tom", new UppercaseDelegate(UppercaseFirst));
      WriteOutput("tom", new UppercaseDelegate(UppercaseLast));
      WriteOutput("tom", new UppercaseDelegate(UppercaseAll));
      Console.ReadLine();
   }
}
}
```

OUTPUT:

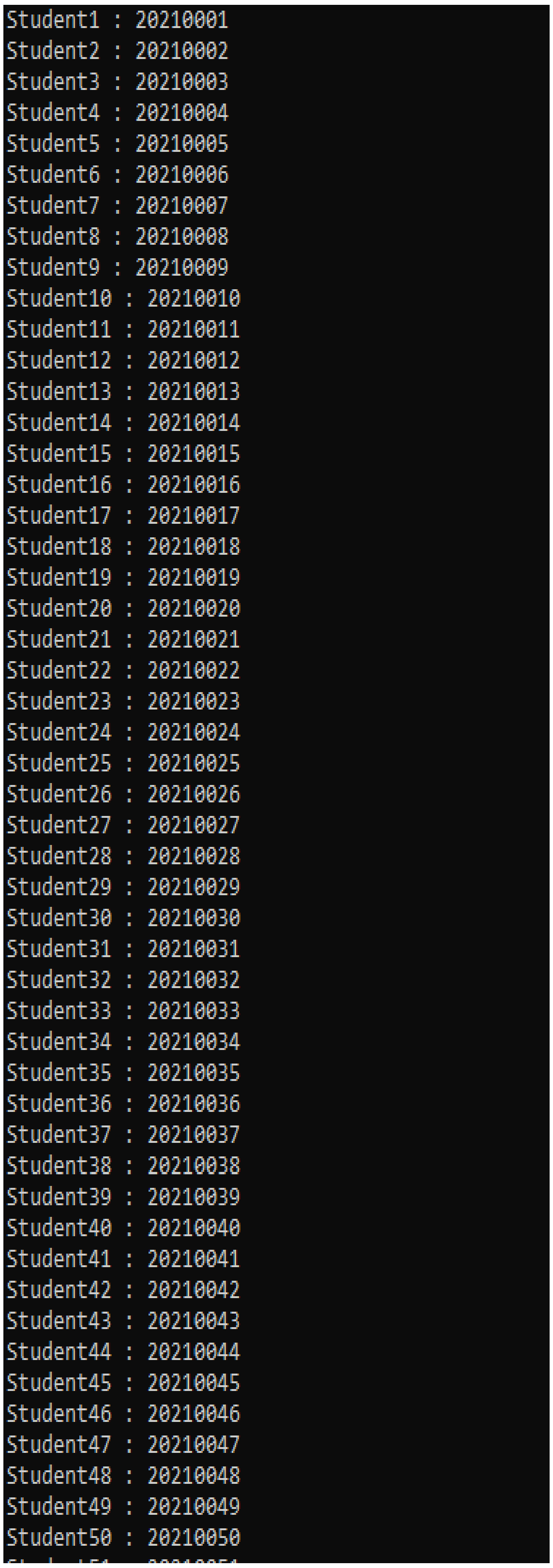


```
input String:tom
Output String:Tom
input String:tom
Output String:toM
input String:tom
Output String:TOM
```

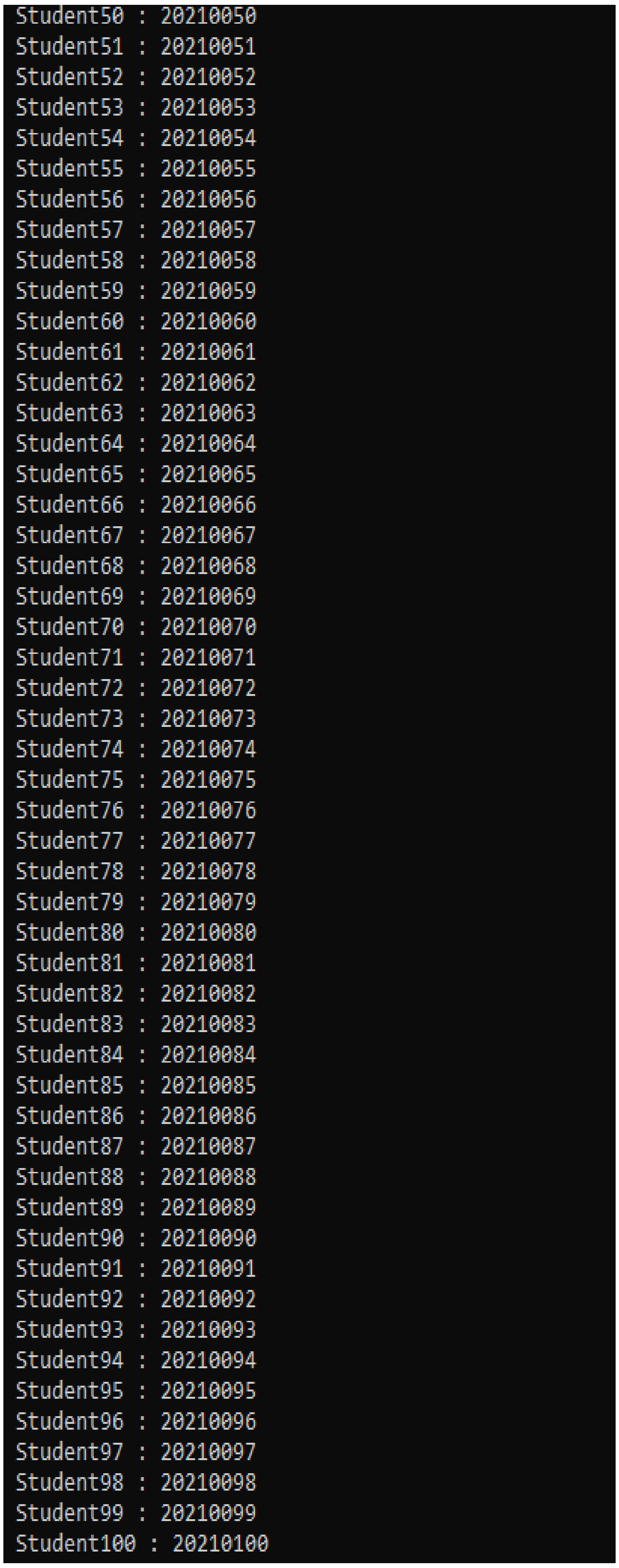
14.C# program to generate Register Number automatically for 100 students using static constructor.

```
using System;
namespace Exercises
{
class RegisterNum
{
    int regNo;
    static int startNum;
    static RegisterNum()
    {
        startNum = 20210000;
    }
    RegisterNum()
    {
        regNo = ++startNum;
    }
    public static void Main(string[] args)
    {
        for(int i=0;i<100;i++)
        {
            RegisterNum Student = new RegisterNum();
            Console.WriteLine("Student{0} : {1}", i + 1, Student.regNo);
        }
    }
}
}
```

OUTPUT:



```
Student1 : 20210001
Student2 : 20210002
Student3 : 20210003
Student4 : 20210004
Student5 : 20210005
Student6 : 20210006
Student7 : 20210007
Student8 : 20210008
Student9 : 20210009
Student10 : 20210010
Student11 : 20210011
Student12 : 20210012
Student13 : 20210013
Student14 : 20210014
Student15 : 20210015
Student16 : 20210016
Student17 : 20210017
Student18 : 20210018
Student19 : 20210019
Student20 : 20210020
Student21 : 20210021
Student22 : 20210022
Student23 : 20210023
Student24 : 20210024
Student25 : 20210025
Student26 : 20210026
Student27 : 20210027
Student28 : 20210028
Student29 : 20210029
Student30 : 20210030
Student31 : 20210031
Student32 : 20210032
Student33 : 20210033
Student34 : 20210034
Student35 : 20210035
Student36 : 20210036
Student37 : 20210037
Student38 : 20210038
Student39 : 20210039
Student40 : 20210040
Student41 : 20210041
Student42 : 20210042
Student43 : 20210043
Student44 : 20210044
Student45 : 20210045
Student46 : 20210046
Student47 : 20210047
Student48 : 20210048
Student49 : 20210049
Student50 : 20210050
```

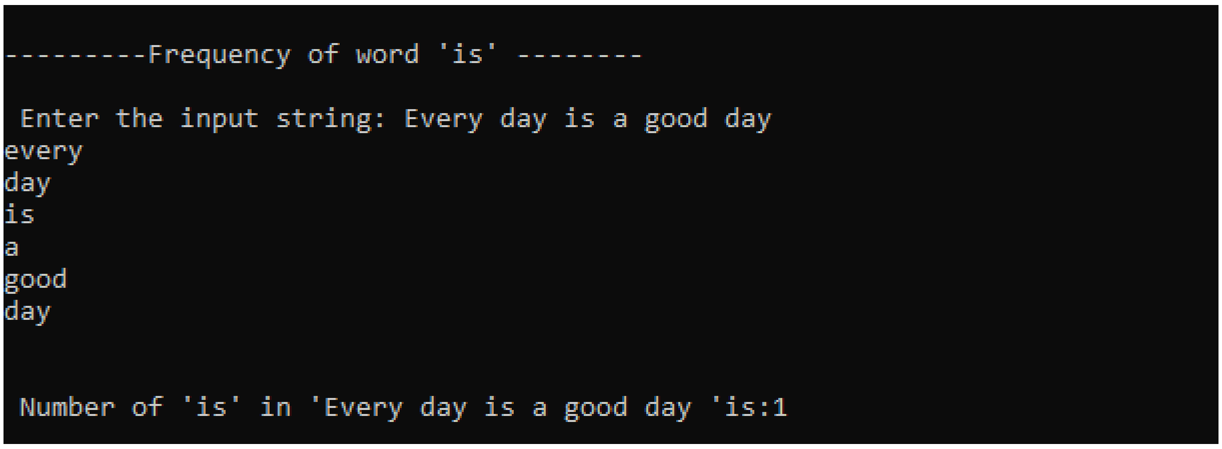


```
Student50 : 20210050
Student51 : 20210051
Student52 : 20210052
Student53 : 20210053
Student54 : 20210054
Student55 : 20210055
Student56 : 20210056
Student57 : 20210057
Student58 : 20210058
Student59 : 20210059
Student60 : 20210060
Student61 : 20210061
Student62 : 20210062
Student63 : 20210063
Student64 : 20210064
Student65 : 20210065
Student66 : 20210066
Student67 : 20210067
Student68 : 20210068
Student69 : 20210069
Student70 : 20210070
Student71 : 20210071
Student72 : 20210072
Student73 : 20210073
Student74 : 20210074
Student75 : 20210075
Student76 : 20210076
Student77 : 20210077
Student78 : 20210078
Student79 : 20210079
Student80 : 20210080
Student81 : 20210081
Student82 : 20210082
Student83 : 20210083
Student84 : 20210084
Student85 : 20210085
Student86 : 20210086
Student87 : 20210087
Student88 : 20210088
Student89 : 20210089
Student90 : 20210090
Student91 : 20210091
Student92 : 20210092
Student93 : 20210093
Student94 : 20210094
Student95 : 20210095
Student96 : 20210096
Student97 : 20210097
Student98 : 20210098
Student99 : 20210099
Student100 : 20210100
```

15.C# program to find the frequency of the word "is" in a given sentence.

```
using System;
namespace Excercises
{
class FrequencyIS
{
    static void Main(string[] args)
    {
        int count = 0;
        string inputString;
        Console.WriteLine("\n---------Frequency of word 'is' --------");
        Console.Write("\n Enter the input string:");
        inputString = Console.ReadLine();
        char[] separator = { ',',' ', '.', '!', '\n' };
        string testString = inputString.ToLower();
        string[] outcomes = testString.Split(separator);
        foreach(String s in outcomes)
        {
            Console.WriteLine(s);
            if (s == "is")
                count++;
        }
        Console.WriteLine("\n Number of 'is' in '"+inputString+"'is:"+count);
    }
}
}
```

OUTPUT:

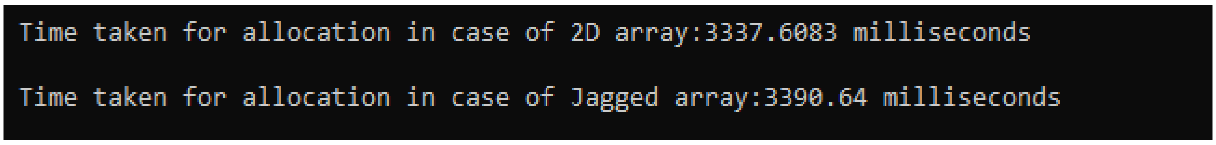


```
---------Frequency of word 'is' --------

 Enter the input string: Every day is a good day
every
day
is
a
good
day


 Number of 'is' in 'Every day is a good day 'is:1
```

16.C# program that benchmarks 2D, jagged array allocation.

```
using System;
using System.Diagnostics;
namespace Exercises
{
class BenchmarkAllocation
{
   const int _max= 100000;
   static void Main(string[] args)
   {
      var Arr2D = new int[100, 100];
      var ArrJagged = new int[100][];
      for(int i=0;i<100;i++)
      {
         ArrJagged[i] = new int[100];
      }
      var Stopwatch2D = Stopwatch.StartNew();

      for(int i=0;i<_max;i++)
      {
         for(int j=0;j<100;j++)
         {
            for(int k=0;k<100;k++)
            {
               Arr2D[j, k] = k;
            }
         }
      }
      Stopwatch2D.Stop();
      var StopwatchJagged = Stopwatch.StartNew();

      for(int i=0;i<_max;i++)
      {
         for(int j=0;j<100;j++)
         {
            for(int k=0;k<100;k++)
            {
               ArrJagged[j][k] = k;
            }
         }
      }
      StopwatchJagged.Stop();
      Console.Write("\n Time taken for allocation in case of 2D array:");
      Console.WriteLine(Stopwatch2D.Elapsed.TotalMilliseconds + " milliseconds");
      Console.Write("\n Time taken for allocation in case of Jagged array:");
      Console.WriteLine(StopwatchJagged.Elapsed.TotalMilliseconds + " milliseconds");
   }
}
}
```

OUTPUT:

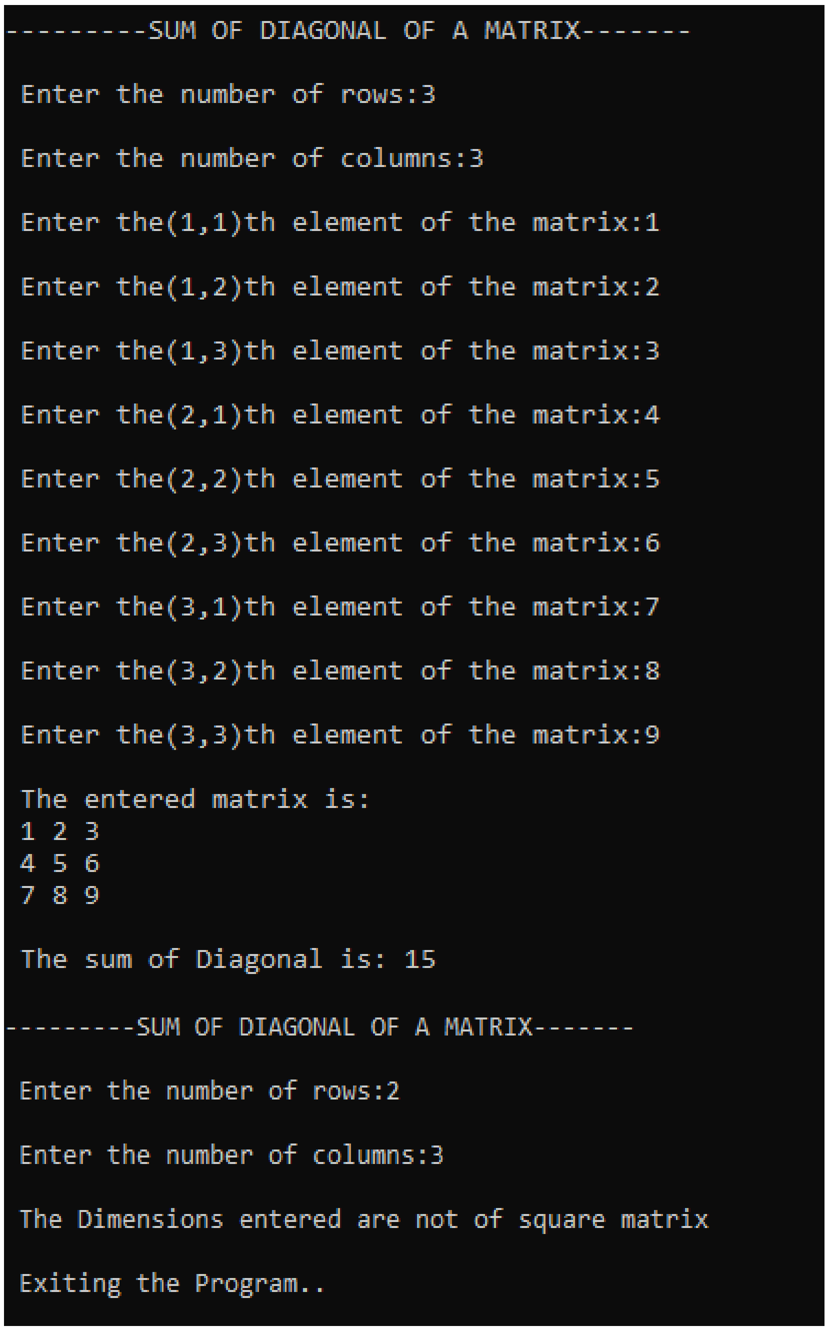


```
Time taken for allocation in case of 2D array:3337.6083 milliseconds

Time taken for allocation in case of Jagged array:3390.64 milliseconds
```

17.C# program to find the sum of the values on Diagonal of the matrix.

```
using System;
namespace SumofDiagonals
{
class SumofDiagonals
{
   static void Main(string[] args)
   {
      int MaxRow, MaxCol, Sum = 0;
      int[,] Matrix;
      Console.WriteLine("\n---------SUM OF DIAGONAL OF A MATRIX-------\n");
      Console.Write("\n Enter the number of rows:");
      MaxRow = Convert.ToInt32(Console.ReadLine());
      Console.Write("\n Enter the number of columns:");
      MaxCol = Convert.ToInt32(Console.ReadLine());
      if(MaxRow!=MaxCol)
      {
         Console.WriteLine("\n The Dimensions entered are not of square matrix");
         Console.WriteLine("\n Exiting the Program..");
         return;
      }
      Matrix = new int[MaxRow, MaxCol];

      for(int i=0;i<MaxRow;i++)
      {
         for(int j=0;j<MaxCol;j++)
         {
            Console.Write("\n Enter the({0},{1})th element of the matrix:", (i + 1), (j + 1));
            Matrix[i, j] = Convert.ToInt32(Console.ReadLine());
         }
      }
      Console.WriteLine("\n The entered matrix is:");

      for(int i=0;i<MaxRow;i++)
      {
         for(int j=0;j<MaxCol;j++)
         {
            Console.Write(" " + Matrix[i, j]);
            if(i==j)
            {
               Sum += Matrix[i, j];
            }
         }
         Console.WriteLine();
      }
      Console.WriteLine("\n The sum of Diagonal is" +Sum);
   }
}
}
```

OUTPUT:

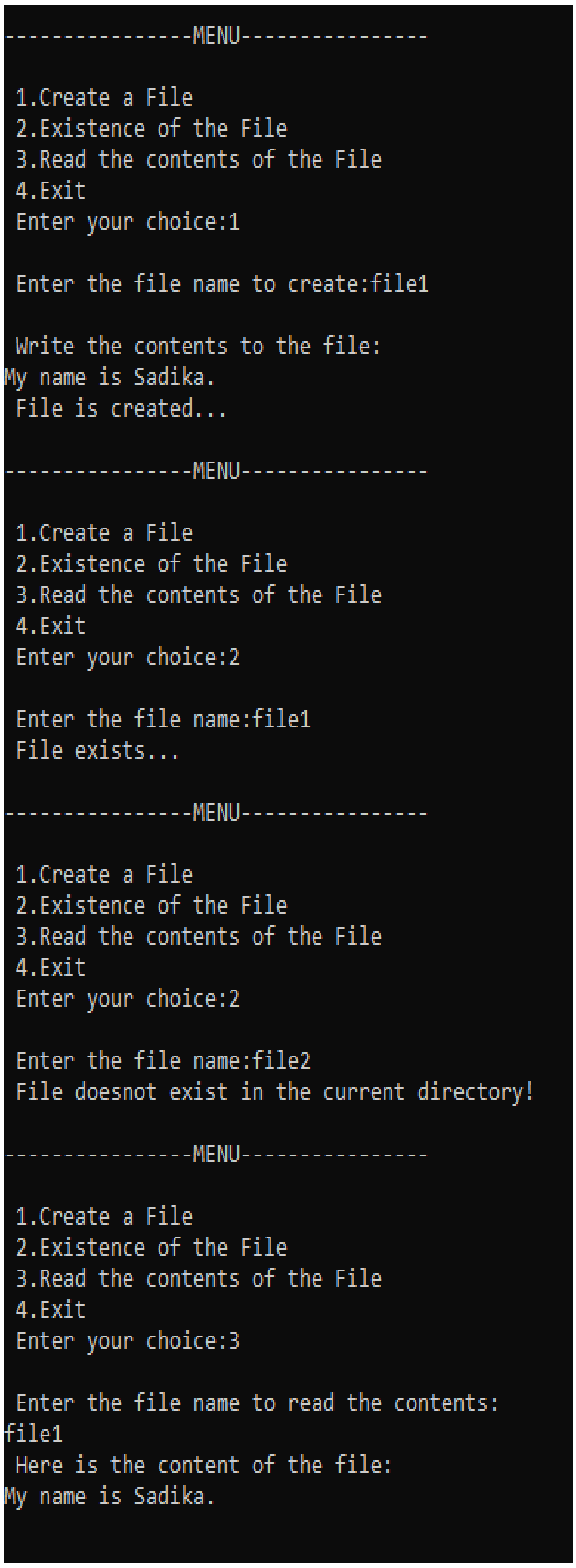


```
---------SUM OF DIAGONAL OF A MATRIX-------

 Enter the number of rows:3

 Enter the number of columns:3

 Enter the(1,1)th element of the matrix:1

 Enter the(1,2)th element of the matrix:2

 Enter the(1,3)th element of the matrix:3

 Enter the(2,1)th element of the matrix:4

 Enter the(2,2)th element of the matrix:5

 Enter the(2,3)th element of the matrix:6

 Enter the(3,1)th element of the matrix:7

 Enter the(3,2)th element of the matrix:8

 Enter the(3,3)th element of the matrix:9

 The entered matrix is:
 1 2 3
 4 5 6
 7 8 9

 The sum of Diagonal is: 15

---------SUM OF DIAGONAL OF A MATRIX-------

 Enter the number of rows:2

 Enter the number of columns:3

 The Dimensions entered are not of square matrix

 Exiting the Program..
```

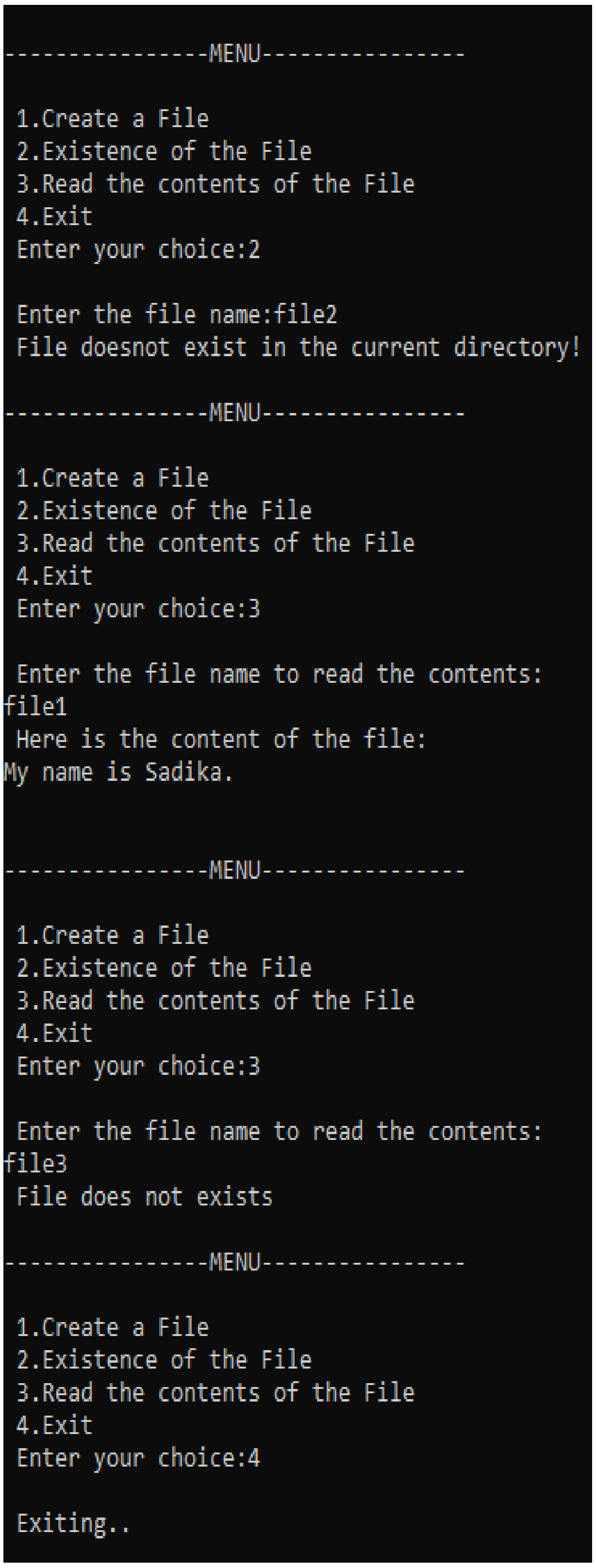
18.C# program to create a File, check the Existence of a File and Read the Contents of the File.

```
using System;
using System.IO;
namespace Exercises
{
class FileRead
{
    public static void Main()
    {
        string fileName;
        while (true)
        {
            Console.WriteLine("\n------MENU-----\n");
            Console.WriteLine("\n 1.Create a File");
            Console.WriteLine("\n 2. Existence of the File");
            Console.WriteLine("\n 3. Read the contents of the File");
            Console.WriteLine("\n 4. Exit");
            Console.WriteLine("\n Enter your choice:");
            int ch = int.Parse(Console.ReadLine());

            switch (ch)
            {
                case 1:
                    Console.Write("\n Enter the file name to create:");
                    fileName = Console.ReadLine();
                    Console.WriteLine("\n Write the contents to the file: \n");
                    string r = Console.ReadLine();
                    using (StreamWriter fileStr = File.CreateText(fileName))
                    {
                        fileStr.WriteLine(r);
                    }
                    Console.WriteLine("File is created...");
                    break;
                case 2:
                    Console.Write("\n Enter the file name:");
                    fileName = Console.ReadLine();
                    if (File.Exists(fileName))
                    {
                        Console.WriteLine("File exists...");
                    }
                    else
                    {
                        Console.WriteLine("File doesnot exist in the current directory!");
                    }
                    break;
                case 3:
                    Console.Write("\n Enter the file name to read the contents:\n");
                    fileName = Console.ReadLine();
                    if (File.Exists(fileName))
                    {
                        using (StreamReader sr = File.OpenText(fileName))
                        {
                            string s = "";
                            Console.WriteLine("Here is the content of the file:");
                            while ((s = sr.ReadLine()) != null)
                            {
                                Console.WriteLine(s);
                            }
                            Console.WriteLine("");
                        }

                    }
                    else
                    {
                        Console.WriteLine("File does not exists");
                    }
                    break;
                case 4:
                    Console.WriteLine("\n Exiting..");
                    return;
                default:
                    Console.WriteLine("\n Invalid choice");
                    break;
            }
        }
    }
}
}
```

OUTPUT:



```
----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:1

 Enter the file name to create:file1

 Write the contents to the file:
My name is Sadika.
 File is created...

----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:2

 Enter the file name:file1
 File exists...

----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:2

 Enter the file name:file2
 File doesnot exist in the current directory!

----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:3

 Enter the file name to read the contents:
file1
 Here is the content of the file:
My name is Sadika.
```

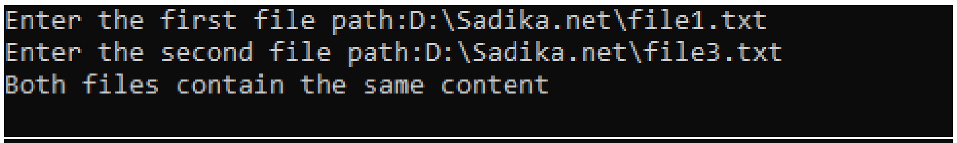


```
----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:2

 Enter the file name:file2
 File doesnot exist in the current directory!

----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:3

 Enter the file name to read the contents:
file1
 Here is the content of the file:
My name is Sadika.


----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:3

 Enter the file name to read the contents:
file3
 File does not exists

----------------MENU----------------

 1.Create a File
 2.Existence of the File
 3.Read the contents of the File
 4.Exit
 Enter your choice:4

 Exiting..
```

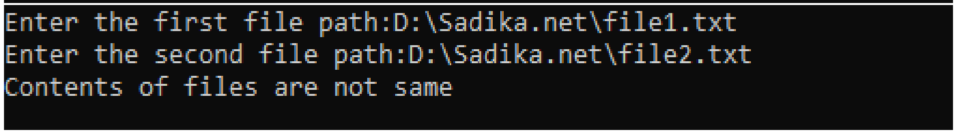
19.C# program to perform File Comparison.

```
using System;
 using System.IO;
namespace Exercises
{
class FileComparison
{
    static void Main()
    {
        string file1;
        string file2;
        Console.Write("Enter the first file path:");
        file1 = Console.ReadLine();
        Console.Write("Enter the second file path:");
        file2 = Console.ReadLine();
        if(!File.Exists(file1))
        {
            Console.WriteLine("First file does not exist!");
        }
        else if(!File.Exists(file2))
        {
            Console.WriteLine("Second file does not exist!");
        }
        else if(File.ReadAllText(file1)==File.ReadAllText(file2))
        {
            Console.WriteLine("Both files contain the same content");
        }
        else
        {
            Console.WriteLine("Contents of files are not same");
        }
    }
}
}
```

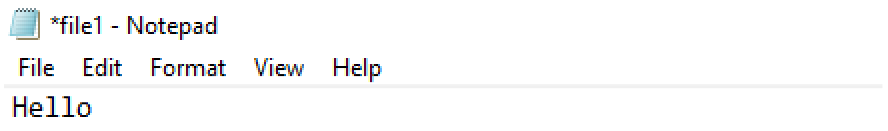
OUTPUT:



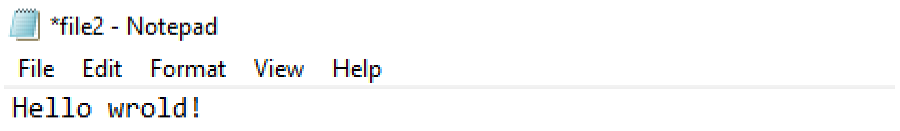
```
Enter the first file path:D:\Sadika.net\file1.txt
Enter the second file path:D:\Sadika.net\file3.txt
Both files contain the same content
```



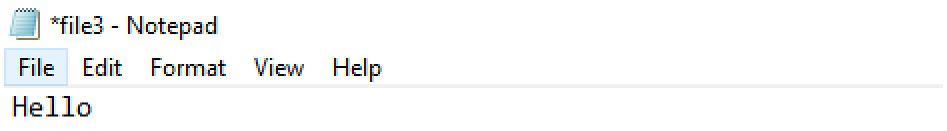
```
Enter the first file path:D:\Sadika.net\file1.txt
Enter the second file path:D:\Sadika.net\file2.txt
Contents of files are not same
```



```
Hello
```



```
Hello wrold!
```

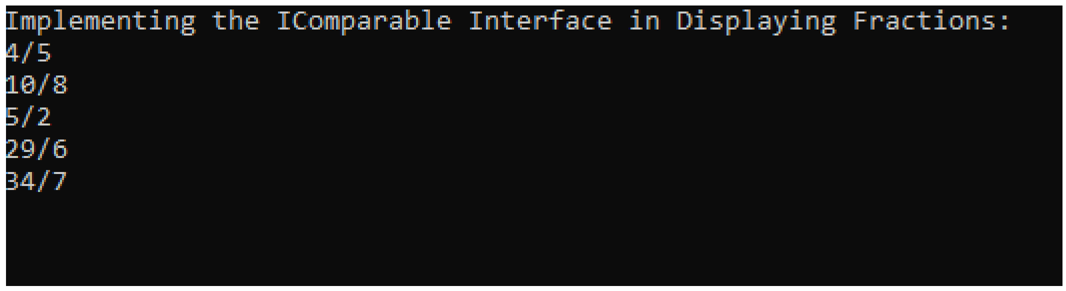


```
Hello
```

20.C# program to Implement IComparable Interface.

```
using System;
namespace Exercises
{
class Fraction : IComparable
{
   int z, n;
   public Fraction(int z, int n)
   {
      this.z = z;
      this.n = n;
   }

   public static Fraction operator+(Fraction a, Fraction b)
   {
      return new Fraction(a.z * b.n + a.n * b.z, a.n * b.n);
   }

   public static Fraction operator*(Fraction a, Fraction b)
   {
      return new Fraction(a.z * b.z, a.n * b.n);
   }

   public int CompareTo(Object obj)
   {
      Fraction f = (Fraction)obj;
      if ((float)z / n < (float)f.z / f.n)
         return -1;
      else if ((float)z / n > (float)f.z / f.n)
         return 1;
      else
         return 0;
   }

   public override string ToString()
   {
      return z + "/" + n;
   }
}

class ICompInterface
{
   public static void Main()
   {
      Fraction[] a ={
         new Fraction(5,2),
         new Fraction(29,6),
         new Fraction(4,5),
         new Fraction(10,8),
         new Fraction(34,7),
      };
      Array.Sort(a);
      Console.WriteLine("Implementing the IComparable Interface in " + "Displaying
Fractions:");
      foreach (Fraction f in a)
      {
         Console.WriteLine(f + " ");
      }
         Console.WriteLine();
         Console.ReadLine();
      }
   }
}
```

OUTPUT:

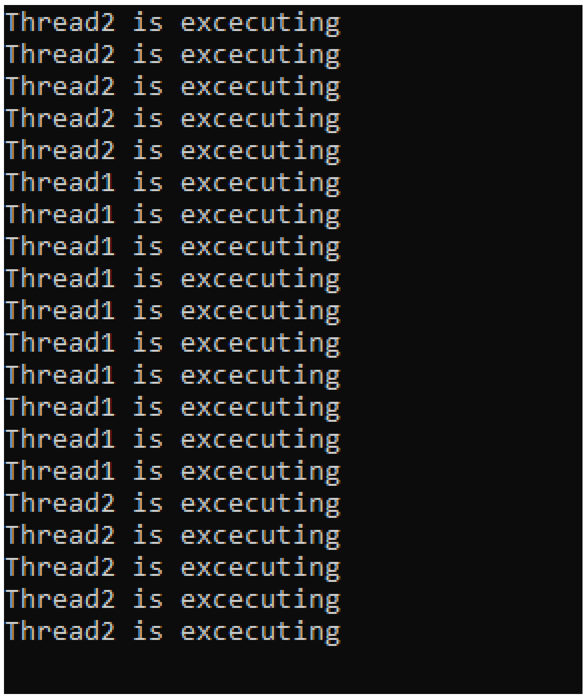


```
Implementing the IComparable Interface in Displaying Fractions:
4/5
10/8
5/2
29/6
34/7
```

21.C# program to create Thread Pools.

```
using System;
using System.Threading;

namespace Exercises
{
class ThreadPoolProg
{
    public void ThreadFun1(Object obj)
    {
        int loop = 0;
        for (loop = 0; loop <= 4; loop++)
        {
            Console.WriteLine("Thread1 is excecuting");
        }
    }

    public void ThreadFun2(Object obj)
    {
        int loop = 0;
        for (loop = 0; loop <= 4; loop++)
        {
            Console.WriteLine("Thread2 is excecuting");
        }
    }

    public static void Main()
    {
        ThreadPoolProg TP = new ThreadPoolProg();
        for (int i = 0; i < 2; i++)
        {
            ThreadPool.QueueUserWorkItem(new WaitCallback(TP.ThreadFun1));
            ThreadPool.QueueUserWorkItem(new WaitCallback(TP.ThreadFun2));
        }
        Console.ReadKey();
    }
}
}
```

OUTPUT:

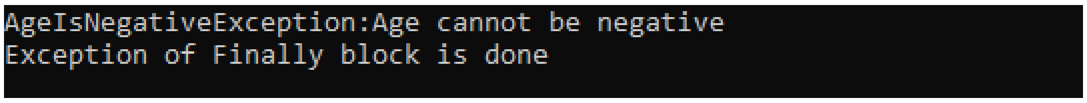


```
Thread2 is excecuting
Thread2 is excecuting
Thread2 is excecuting
Thread2 is excecuting
Thread2 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread1 is excecuting
Thread2 is excecuting
Thread2 is excecuting
Thread2 is excecuting
Thread2 is excecuting
Thread2 is excecuting
```

22.C# program to demonstrate error handling using Try, catch and Finally block.

```
using System;
namespace Exercises
{
    class ExceptionHandling
    {
        static void Main(string[] args)
        {
            Age a = new Age();
            try
            {
                a.displayAge();
            }
            catch(AgeIsNegativeException e)
            {
                Console.WriteLine("AgeIsNegativeException:{0}", e.Message);
            }
            finally
            {
                Console.WriteLine("Exception of Finally block is done");
            }
        }
    }
}
public class AgeIsNegativeException:Exception
{
    public AgeIsNegativeException(string message):base(message)
    {
    }
}
public class Age
{
    int age = -5;
    public void displayAge()
    {
        if(age<0)
        {
            throw (new AgeIsNegativeException("Age cannot be negative"));
        }
        else
        {
            Console.WriteLine("Age is:{0}", age);
        }
    }
}
```

OUTPUT:

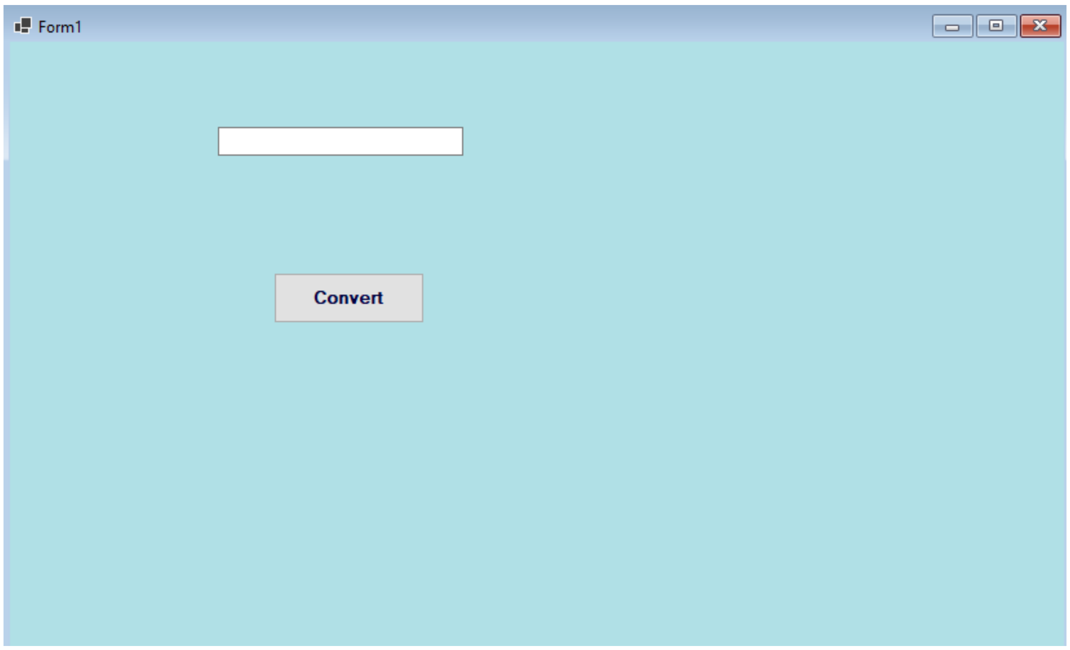


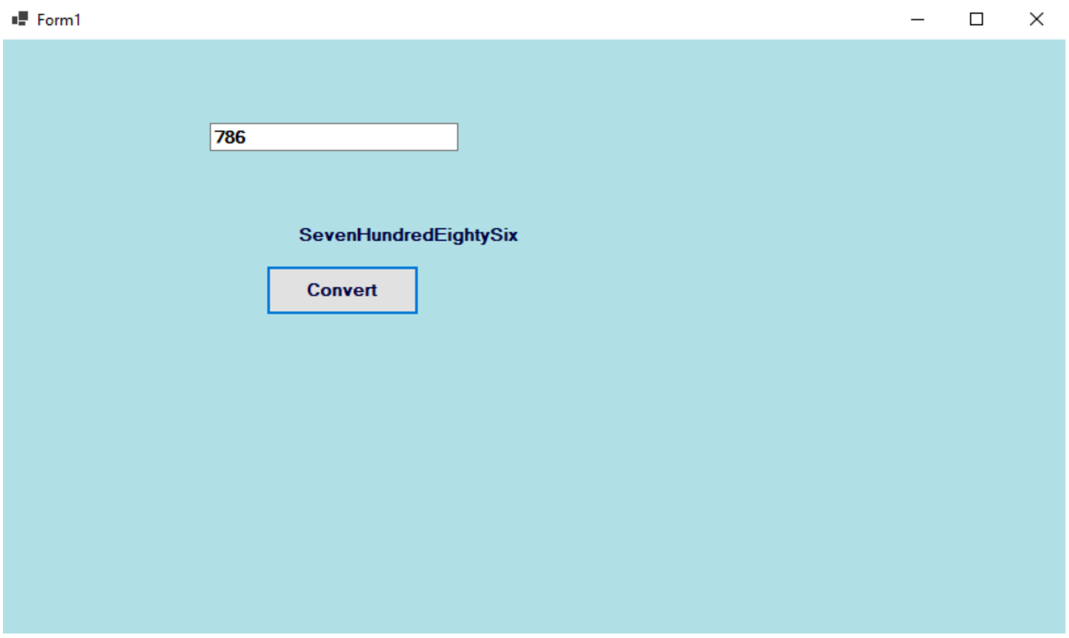
```
AgeIsNegativeException:Age cannot be negative
Exception of Finally block is done
```

23.C# program to convert Digits to words.

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace Program1
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }

        private void button1_Click(object sender, EventArgs e)
        {
            label1.Text = NumtoWord(long.Parse(textBox1.Text));
        }
        public string NumtoWord(long number)
        {
            string word = "";
            if(number==0)
            {
                return "zero";
            }
            if (number< 0)
            {
                return "Minus"+Math.Abs(number);
            }
            if (number /10000000> 0)
            {
                word+=NumtoWord(number/10000000)+"crore";
                number %= 10000000;
            }
            if (number / 100000 > 0)
            {
                word += NumtoWord(number / 100000) + "Lacs";
                number %= 100000;
            }
            if (number / 1000 > 0)
            {
                word += NumtoWord(number / 1000) + "Thousand";
                number %= 1000;
            }
            if (number / 100 > 0)
            {
                word += NumtoWord(number / 100) + "Hundred";
                number %= 100;
            }
            if(number>0)
            {
                string[] units = new string[] { "Zero", "One", "Two", "Three", "Four", "Five", "Six",
"Seven", "Eight", "Nine", "Ten", "Eleven", "Twelve", "Thirteen", "Fourteen", "Fifteen",
"Sixteen", "Seventeen", "Eighteen", "Ninteen" };
                string[] Tens = new string[] { "Zero", "Ten", "Twenty", "Thirty", "Fourty", "Fifty",
"Sixty", "Seventy", "Eighty", "Ninety" };
                if(number<20)
                {
                    word += units[number];
                }
                else
                {
                    word += Tens[number / 10];
                    if(number%10>0)
                    {
                        word += units[number % 10];
                    }
                }
            }
            return word;
        }

        private void Form1_Load(object sender, EventArgs e)
        {

        }
    }
}
```

OUTPUT:



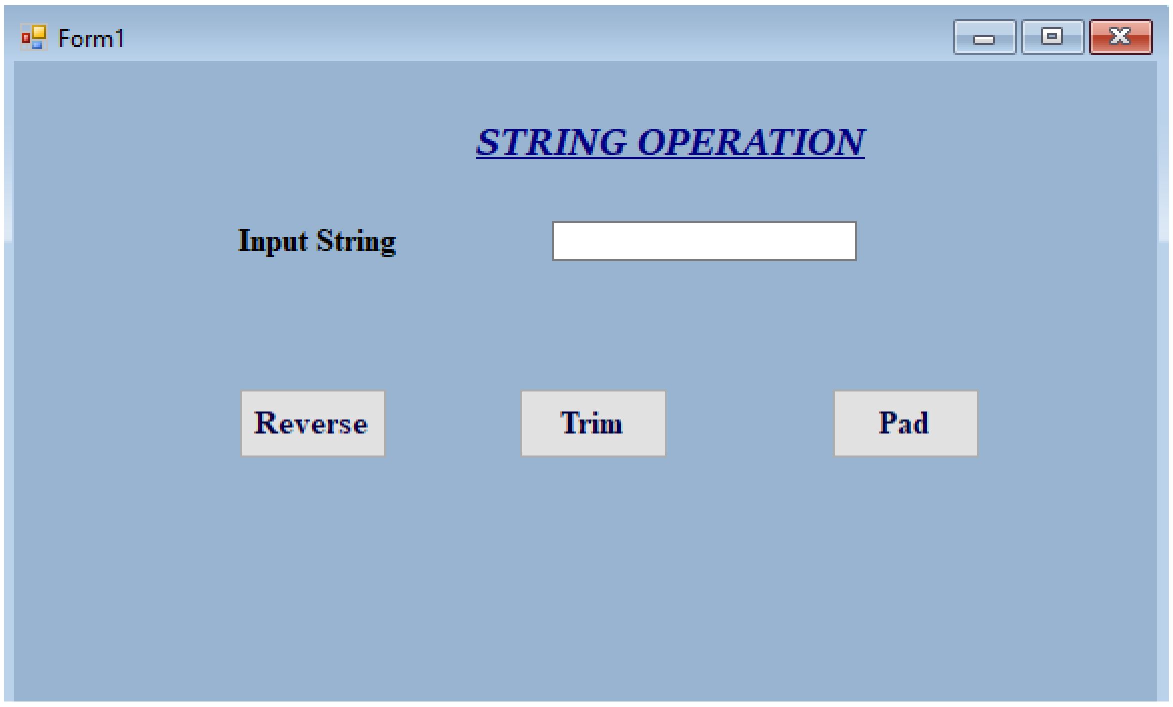


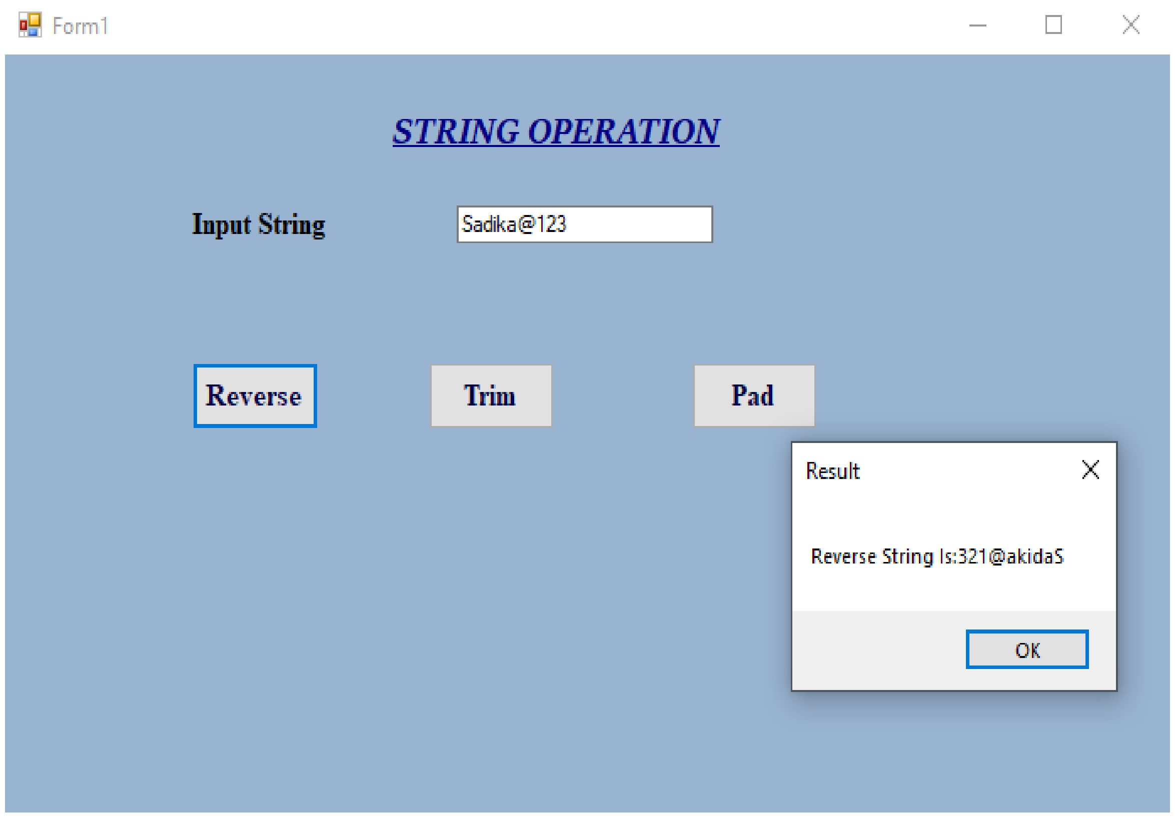
```
786
SevenHundredEightySix
```

24.C# program to perform Reversal, Padding and Trimming operations on string.

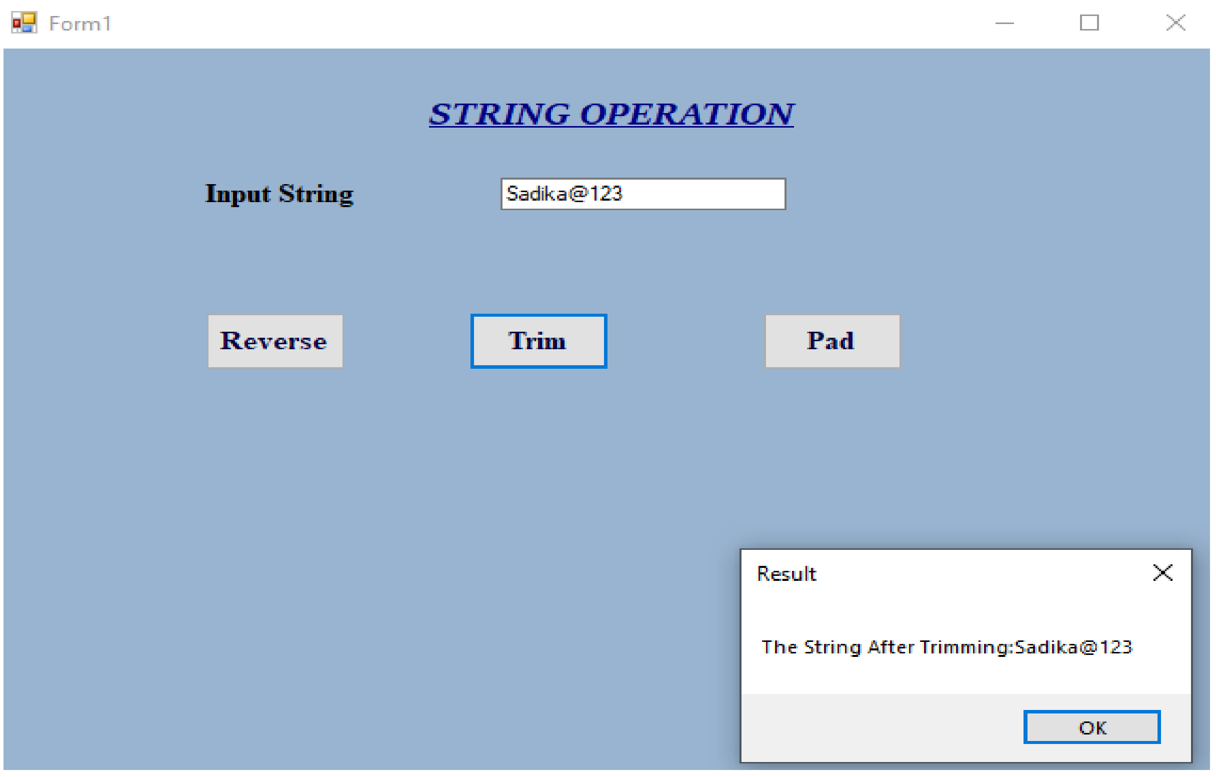
```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace program3
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }

        private void btnrev_Click(object sender, EventArgs e)
        {
            string inputString, revstr = "";
            int Length;
            inputString = txtInput.Text;
            Length = inputString.Length - 1;
            while(Length>=0)
            {
                revstr = revstr + inputString[Length];
                Length--;
            }
            MessageBox.Show("Reverse String Is:" + revstr, "Result");
        }

        private void btntrim_Click(object sender, EventArgs e)
        {
            string inputString;
            inputString = txtInput.Text;
            MessageBox.Show("The String After Trimming:" +inputString.Trim(), "Result");
        }

        private void btnpad_Click(object sender, EventArgs e)
        {
            string inputString;
            inputString = txtInput.Text;
            inputString = inputString.PadLeft(10, '*');
            inputString = inputString.PadRight(15, '*');
            MessageBox.Show("The String After Paddingg:" + inputString, "Result");
        }
    }
}
```

OUTPUT:



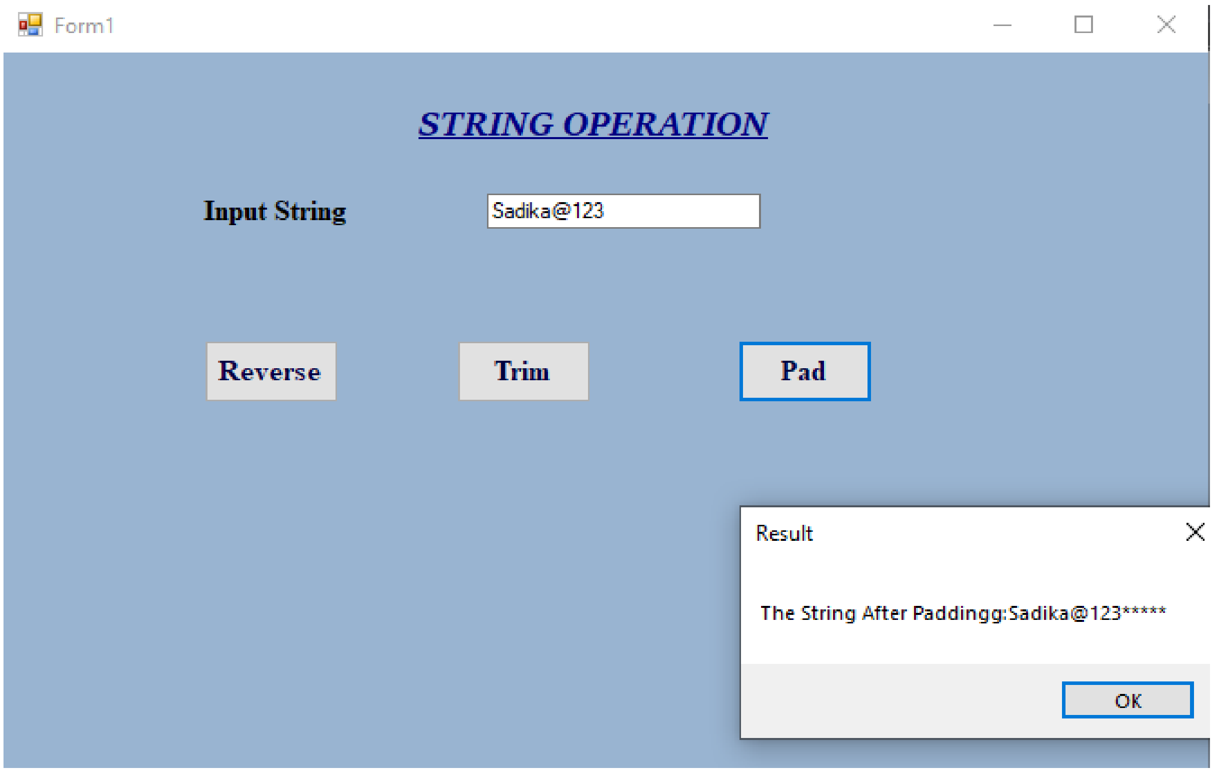


Reverse String Is:321@akidaS



Sadika@123

The String After Trimming:Sadika@123



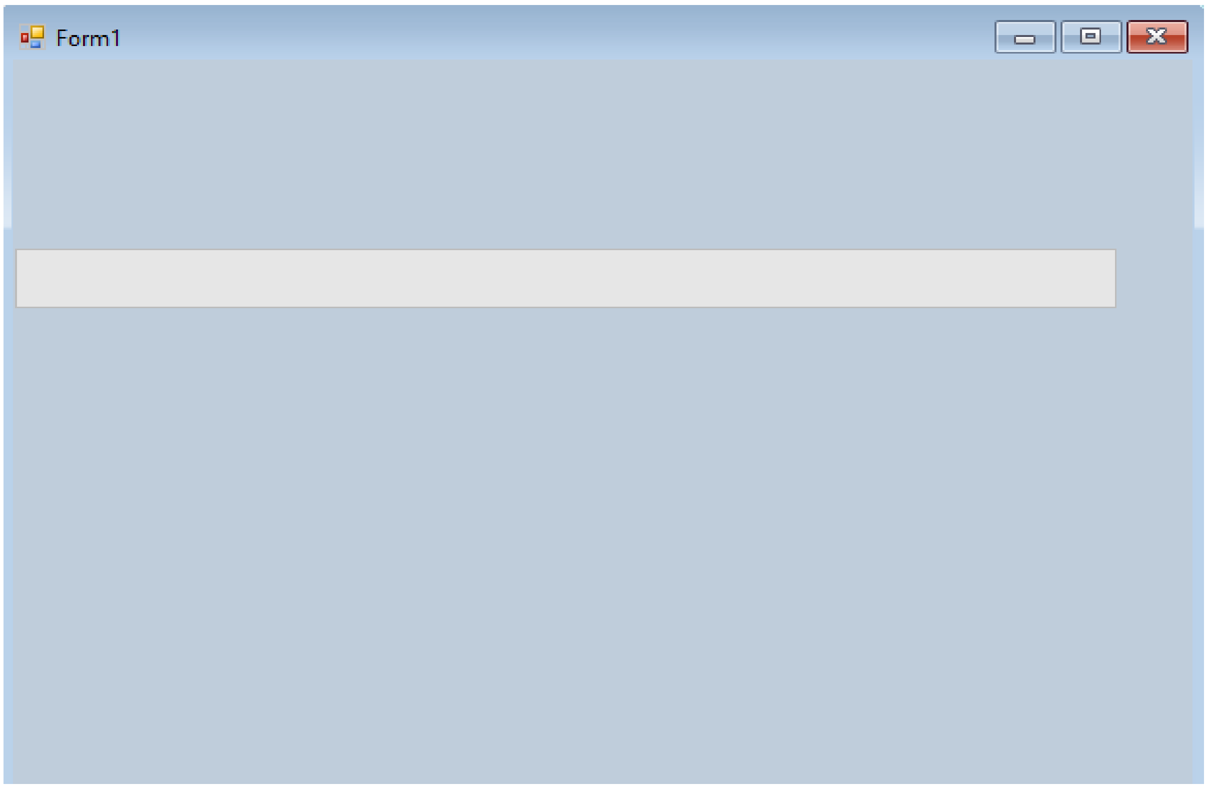
Sadika@123

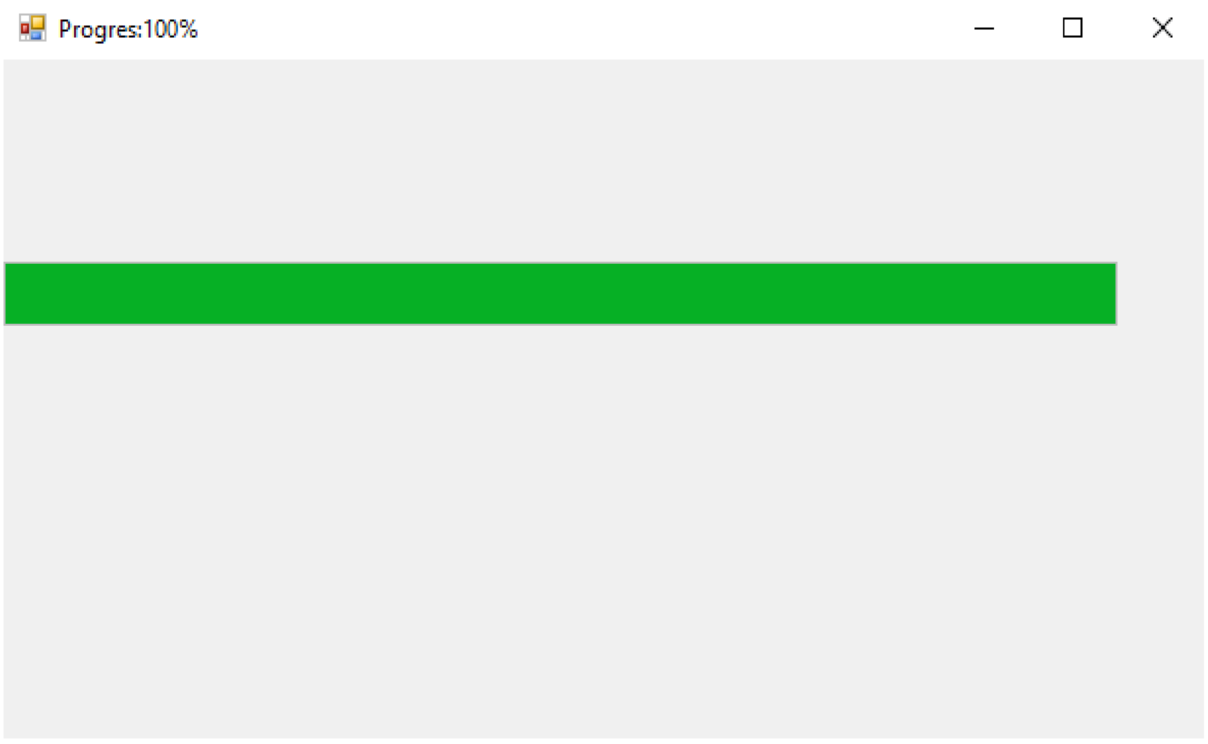
The String After Paddingg:Sadika@123*****

25.C# program to create a progress Bar Control.

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading;
using System.Windows.Forms;

namespace program4
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }
        private void Form1_Load(object sender, EventArgs e)
        {
            backgroundWorker1.WorkerReportsProgress = true;
            backgroundWorker1.RunWorkerAsync();
        }

        private void backgroundWorker1_DoWork(object sender, DoWorkEventArgs e)
        {
            for(int i=1;i<=100;i++)
            {
                Thread.Sleep(50);
                backgroundWorker1.ReportProgress(i);
            }
        }

        private void backgroundWorker1_ProgressChanged(object sender,
ProgressChangedEventArgs e)
        {
            progressBar1.Value = e.ProgressPercentage;
            this.Text = "Progres:" + e.ProgressPercentage.ToString() + "%";
        }

    }
}
```

OUTPUT:

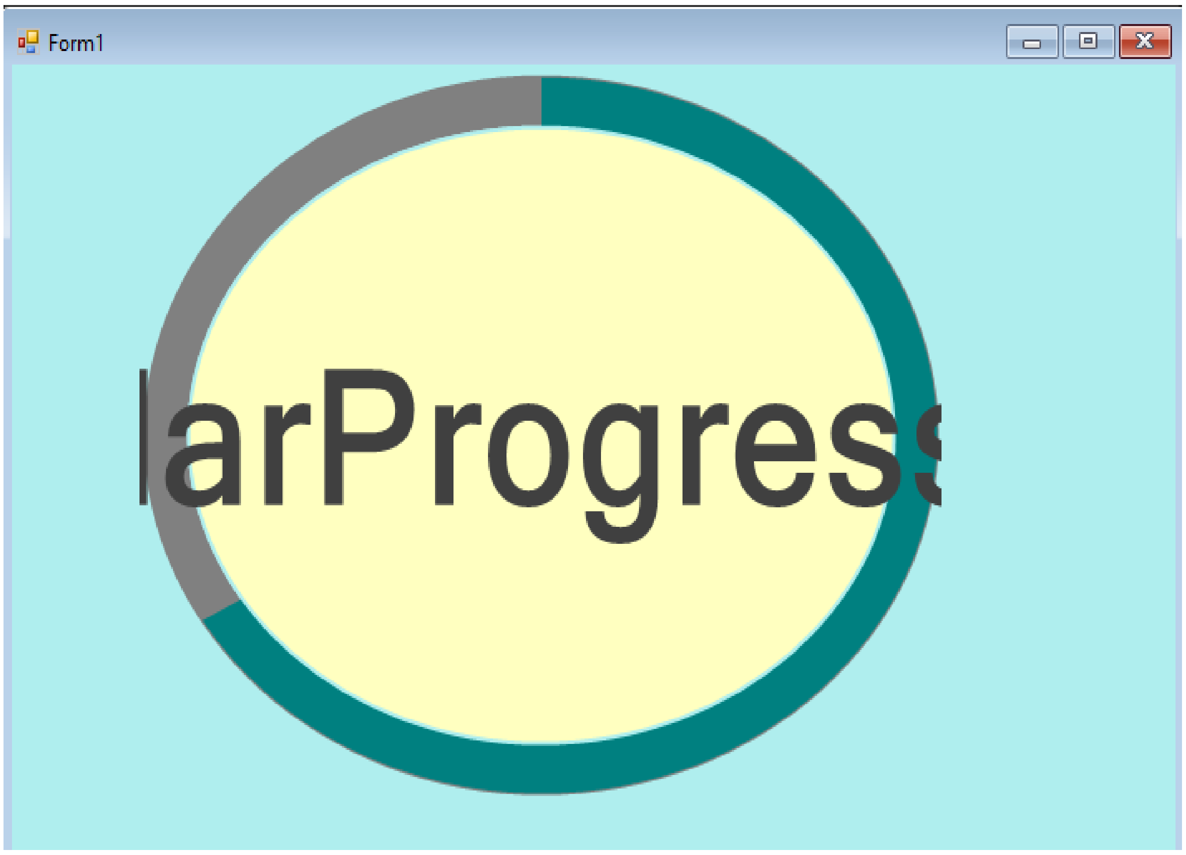


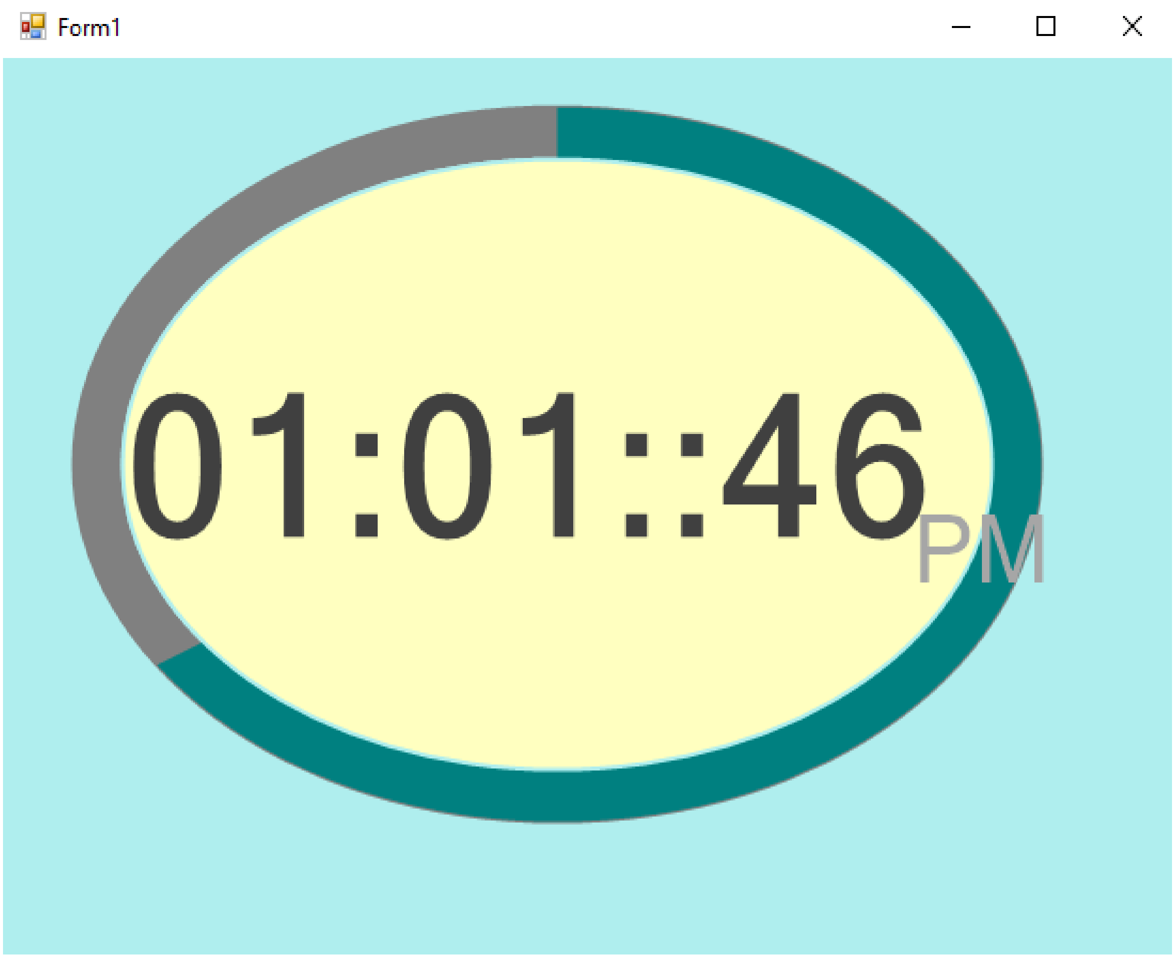


26. Develop a winform application to create flat clock.

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace program5
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }

        private void Form1_Load(object sender, EventArgs e)
        {
            System.Timers.Timer timer = new System.Timers.Timer();
            timer.Interval = 100;
            timer.Elapsed += Timer_Elapsed;
            timer.Start();
        }

        private void Timer_Elapsed(object sender, System.Timers.ElapsedEventArgs e)
        {
            circularProgressBar1.Invoke((MethodInvoker)delegate
            {
                circularProgressBar1.Text = DateTime.Now.ToString("hh:mm::ss");
                circularProgressBar1.SubscriptText = DateTime.Now.ToString("tt");

            });
        }
    }
}
```

OUTPUT:

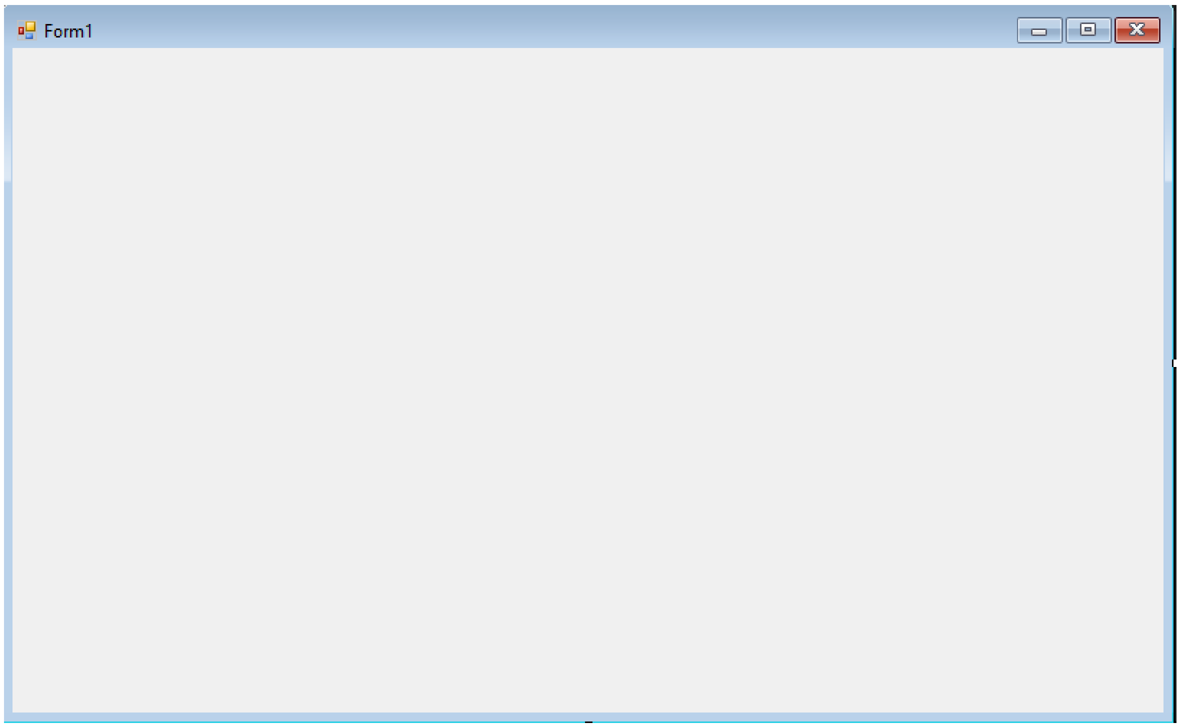


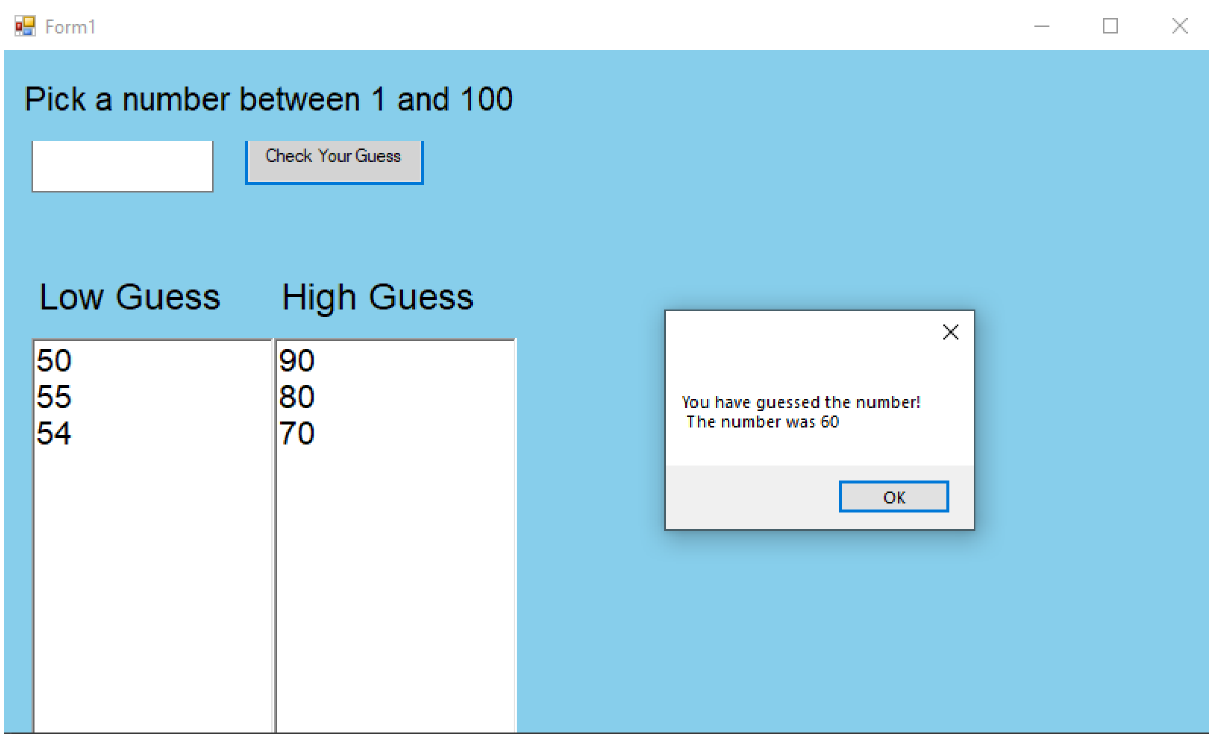


27.C# program to perform a number guessing game.

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace program9
{
    public partial class Form1 : Form
    {
        static Random r = new Random();
        int value;
        int guessnum;
        int win = 10;
        int guess = 1;
        Button button1;
        TextBox textBox1;
        RichTextBox richTextBox1;
        RichTextBox richTextBox2;
        Label label1;
        Label label2;
        Label label3;
        Label label4;
        public Form1()
        {
            InitializeComponent();
            value = r.Next(100);
            this.Controls.Clear();
            this.BackColor = Color.SkyBlue;
            this.AutoSize = true;
            this.Padding = new Padding(16);

            label1 = new Label();
            label1.Text = "Pick a number between 1 and 100";
            label1.Bounds = new Rectangle(10, 20, 340, 40);
            label1.Font = new Font("Arial", 16);

            textBox1 = new TextBox();
            textBox1.Bounds = new Rectangle(20, 50, 120, 80);
            textBox1.Font = new Font("Arial", 24);

            button1 = new Button();
            button1.Text = " Check Your Guess ";
            button1.Bounds = new Rectangle(160, 50, 120, 40);
            button1.BackColor = Color.LightGray;
            button1.Click += new EventHandler(button1_Click);

            label2 = new Label();
            label2.Text = "Low Guess";
            label2.Bounds = new Rectangle(20, 150, 160, 40);
            label2.Font = new Font("Arial", 18);

            richTextBox1 = new RichTextBox();
            richTextBox1.Bounds = new Rectangle(20, 190, 160, 300);
            richTextBox1.Font = new Font("Arial", 16);

            label3 = new Label();
            label3.Text = "High Guess";
            label3.Bounds = new Rectangle(180, 150, 160, 40);
            label3.Font = new Font("Arial", 18);

            richTextBox2 = new RichTextBox();
            richTextBox2.Bounds = new Rectangle(180, 190, 160, 300);
            richTextBox2.Font = new Font("Arial", 16);

            label4 = new Label();
            label4.Bounds = new Rectangle(20, 100, 340, 40);
            label4.Font = new Font("Arial", 16);

            this.Controls.Add(label1);
            this.Controls.Add(textBox1);
            this.Controls.Add(button1);
            this.Controls.Add(label4);
            this.Controls.Add(label2);
            this.Controls.Add(label3);
            this.Controls.Add(richTextBox1);
            this.Controls.Add(richTextBox2);
        }

        private void button1_Click(object sender, EventArgs e)
        {

            if (textBox1.Text == "")
            {
                return;
            }
            guessnum = Convert.ToInt32(textBox1.Text);
            textBox1.Text = String.Empty;
            if (win >= 0)
            {
                if (guessnum == value)
                {
                    MessageBox.Show("You have guessed the number! \n The number was " +
value);
                    InitializeComponent();
                }
                else if (guessnum < value)
                {
                    richTextBox1.Text += guessnum + "\n";
                    MessageBox.Show("wrong Guess and number of guesses left are " + (10 - guess));
                }
                else if (guessnum > value)
                {
                    richTextBox2.Text += guessnum + "\n";
                    MessageBox.Show("wrong Guess and number of guesses left are " + (10 - guess));
                }
                guess++;
                win--;
            }
            if (guess == 11)
            {
                MessageBox.Show("You loose,Correct Guess is " + value);
            }
        }
        /*static void Main()
        {
            Application.Run(new Form1());
        }
        */
    }
}
```

OUTPUT:





Pick a number between 1 and 100

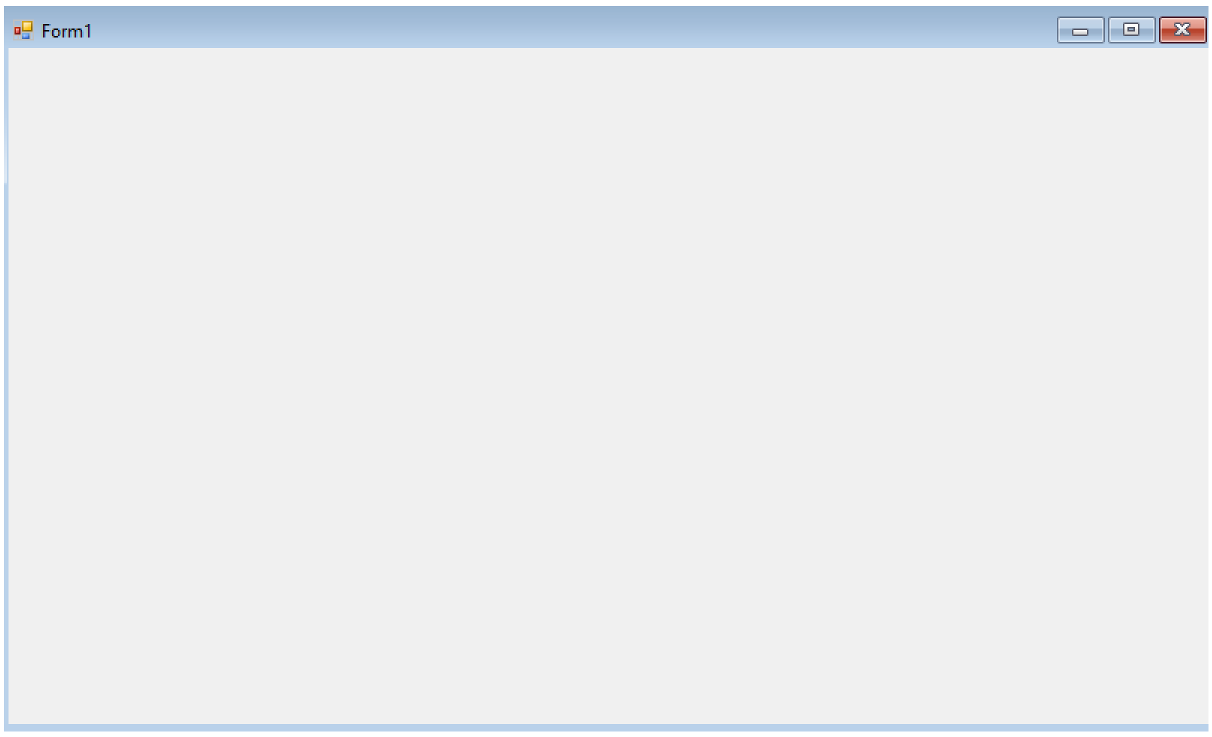
```
Low Guess    High Guess
50           90
55           80
54           70
```

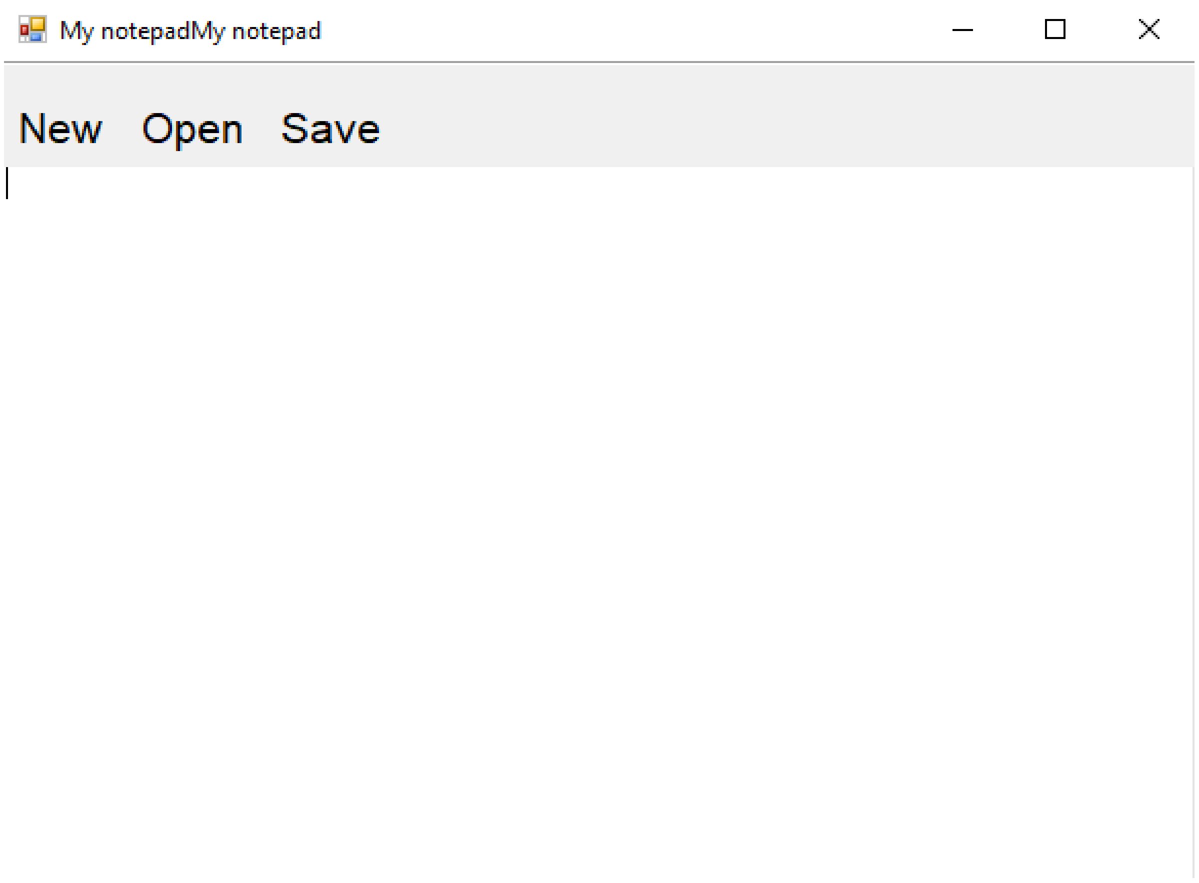
```
You have guessed the number!
 The number was 60
```

28.Develop an application to create a notepad.

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;

namespace program11
{
    public partial class Form1 : Form
    {
        private string fileName;
        private RichTextBox txtContent;
        private ToolBar toolBar;

        internal Form1()
        {
            fileName = null;
            initializeComponents();
        }
        void initializeComponents()
        {
            this.Text = "My notepad";
            this.MinimumSize = new Size(600, 450);
            this.FormClosing += new FormClosingEventHandler(NotepadClosing);
            this.MaximizeBox = true;

            toolBar = new ToolBar();
            toolBar.Font = new Font("Arial", 16);
            toolBar.Padding = new Padding(4);
            toolBar.ButtonClick += new ToolBarButtonClickEventHandler(toolBarClicked);

            ToolBarButton toolBarButton1 = new ToolBarButton();
            ToolBarButton toolBarButton2 = new ToolBarButton();
            ToolBarButton toolBarButton3 = new ToolBarButton();
            toolBarButton1.Text = "New";
            toolBarButton2.Text = "Open";
            toolBarButton3.Text = "Save";

            toolBar.Buttons.Add(toolBarButton1);
            toolBar.Buttons.Add(toolBarButton2);
            toolBar.Buttons.Add(toolBarButton3);

            txtContent = new RichTextBox();
            txtContent.Size = this.ClientSize;
            txtContent.Height -= toolBar.Height;
            txtContent.Top = toolBar.Height;
            txtContent.Anchor = AnchorStyles.Left | AnchorStyles.Right | AnchorStyles.Top |
AnchorStyles.Bottom;
            txtContent.Font = new Font("Arial", 16);
            txtContent.AcceptsTab = true;
            txtContent.Padding = new Padding(8);
            this.Controls.Add(toolBar);
            this.Controls.Add(txtContent);
        }
        private void toolBarClicked(object sender, ToolBarButtonClickEventArgs e)
        {
            saveFile();

            switch(toolBar.Buttons.IndexOf(e.Button))
            {
                case 0:this.Text += "My notepad";
                    txtContent.Text = string.Empty;
                    fileName = null;
                    break;
                case 1:OpenFileDialog openDlg = new OpenFileDialog();
                        if(DialogResult.OK==openDlg.ShowDialog())
                    {
                        fileName = openDlg.FileName;
                        txtContent.LoadFile(fileName);
                        this.Text = "My notepad" + fileName;
                    }
                    break;
            }
        }
        void saveFile()
        {
            if(fileName==null)
            {
                SaveFileDialog saveDlg = new SaveFileDialog();
                if(DialogResult.OK==saveDlg.ShowDialog())
                {
                    fileName = saveDlg.FileName;
                    this.Text += "" + fileName;
                }
            }
            else
            {
                txtContent.SaveFile(fileName, RichTextBoxStreamType.RichText);
            }
        }
        private void NotepadClosing(Object sender,FormClosingEventArgs e)
        {
            saveFile();
        }
      private void Form1_Load(object sender, EventArgs e)
        {

        }
    }
}
```

OUTPUT:




My notepadMy notepad
New
Open
Save

29.Develop an application to construct a graphical binary tree where you need to create, add, search and remove nodes.

```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;
using System.Drawing.Drawing2D;

namespace program12
{
    public partial class Form1 : Form
    {
        private Node root;
        public Form1()
        {
            InitializeComponent();
            this.root = null;
            test();
        }

        void test()
        {
            textBox1.Text = "5";
            button1_Click(button1, null);
            textBox1.Text = "3";
            button1_Click(button1, null);
            textBox1.Text = "2";
            button1_Click(button1, null);
            textBox1.Text = "1";
            button1_Click(button1, null);
            textBox1.Text = "4";
            button1_Click(button1, null);
            textBox1.Text = "7";
            button1_Click(button1, null);
            textBox1.Text = "6";
            button1_Click(button1, null);
            textBox1.Text = "8";
            button1_Click(button1, null);
}



private void button1_Click(object sender, EventArgs e)
{
    int value = int.Parse(textBox1.Text);
    if (root == null)
        root = new Node(value);
    else

    {
        if (root.Add(value) == false)
            MessageBox.Show("The value already exists!");

    }
    drawTree();
}

private void button2_Click(object sender, EventArgs e)
{
    int value = int.Parse(textBox1.Text);
    if (root != null)

    {
        bool status = root.Remove(value, root, ref root);
        if (status == false)

        {
            MessageBox.Show("the value does not exists");

        }

    }
    drawTree();
}

private void button3_Click(object sender, EventArgs e)
{
    root = null;
    pictureBox1.Image = null;
}

private void button4_Click(object sender, EventArgs e)
```

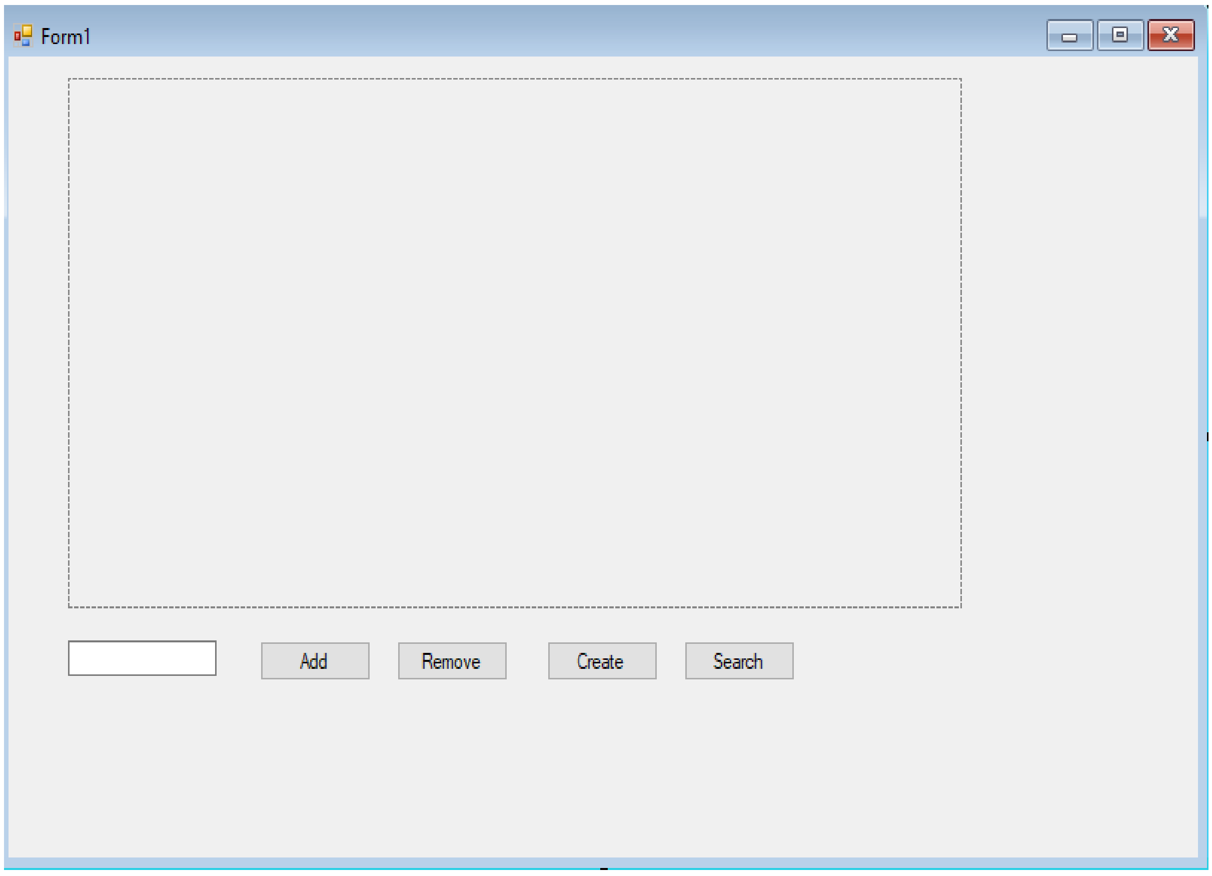
```
    {
        string msg;
        int value = int.Parse(textBox1.Text);
        if (root == null)

        {
            msg = "Tree is empty";
        }
        else

        {
            if (root.Exists(value))

            {
                msg = "Value found";
            }
            else

            {
                msg = "Value not found";

            }

        }
        MessageBox.Show(msg);
    }
    void drawTree()
    {
        if (root != null)
            pictureBox1.Image = root.Draw();
        else
            pictureBox1.Image = null;
        this.Update();
    }
}
class Node
{
    internal Node left { get; set; }
    internal Node right { get; set; }
    internal int value;
    internal int center = 12;
    private static Bitmap nodeBg = new Bitmap(30, 25);
    private static Font font = new Font("Arial", 14);
    internal Node(int value)
```

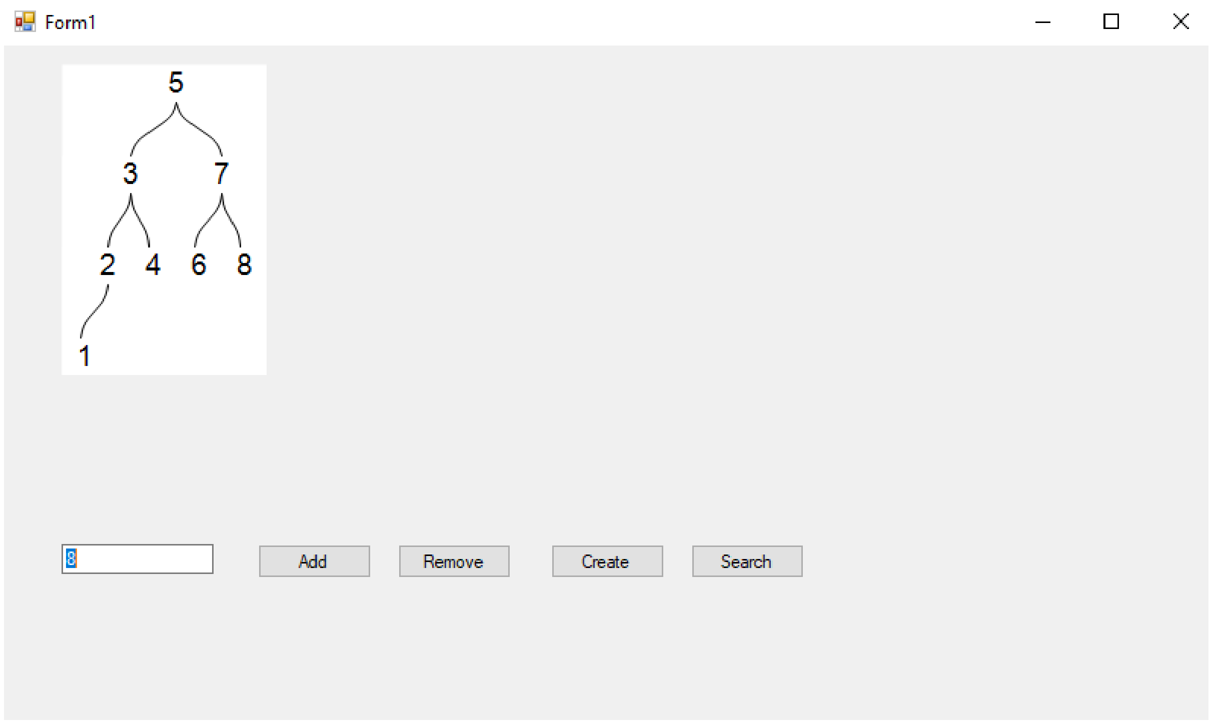
```
        {
            this.value = value;
        }
        internal bool Add(int value)
        {
            Node node = new Node(value);
            if (value < this.value)
            {
                if (this.left == null)
                {
                    this.left = node;
                    return true;
                }
                else
                    return this.left.Add(value);
            }
            else if (value > this.value)
            {
                if (this.right == null)

             {
                    this.right = node;
                    return true;
                }
else
                    return this.right.Add(value);
            }
            return false;
        }
        internal bool Remove(int value, Node parent, ref Node root)
        {
            if (value < this.value)
            {
                if (left != null)
                {
                    return left.Remove(value, this, ref root);
                }
            }
            else if (value > this.value)
            {
                if (right != null)
                {
                    return right.Remove(value, this, ref root);
                }
```

```
    }
    else if (value == this.value)
    {
        bool isLeft = (this == parent.left);
        if (left == null && right == null)
        {
            if (root == this)
                root = null;
            else
            if (isLeft) parent.left = null; else parent.right = null;
        }
        else if (right == null)
        {
            if (isLeft) parent.left = left; else parent.right = left;
            if (root == this)
                root = left;
        }
        else
        {
            if (right.left == null)
            {
                right.left = left;
                if (isLeft) parent.left = right;
                else

            parent.right = right;
                if (root == this)
                    root = right;
            }
            else
            {
                Node node = right;
                while (node.left.left != null)
                    node = node.left;
                Console.WriteLine("Node: " + node.value);
                this.value = node.left.value;
                Console.WriteLine("here");
                node.left = null;
            }
        }
        return true;
    }
    return false;
}
```

```
        public Image Draw()
        {
            Size lSize = new Size(nodeBg.Width / 2, 0);
            Size rSize = new Size(nodeBg.Width / 2, 0);
            Image lNodeImg = null;
            Image rNodeImg = null;
            int lCenter = 0, rCenter = 0;

            if (this.left != null)
            {
                lNodeImg = left.Draw();
                lSize = lNodeImg.Size;
                this.center = lSize.Width;
                lCenter = left.center;
            }
            if (this.right != null)
            {
                rNodeImg = right.Draw();
                rSize = rNodeImg.Size;
                rCenter = right.center;
            }
            int maxHeight = (lSize.Height < rSize.Height) ? rSize.Height : lSize.Height;
            if (maxHeight > 0) maxHeight += 35;

        Size resultSize = new Size(lSize.Width + rSize.Width, nodeBg.Size.Height +
maxHeight);
            Bitmap result = new Bitmap(resultSize.Width, resultSize.Height);

            Graphics g = Graphics.FromImage(result);
            g.SmoothingMode = SmoothingMode.HighQuality;
            g.FillRectangle(Brushes.White, new Rectangle(new Point(0, 0), resultSize));
            g.DrawImage(nodeBg, lSize.Width - nodeBg.Width / 2, 0);

            string str = "" + value;
            g.DrawString(str, font, Brushes.Black, lSize.Width - nodeBg.Width / 2 + 7,
           nodeBg.Height / 2f - 12);
            Pen pen = new Pen(Brushes.Black, 1.2f);
            float x1 = center;
            float y1 = nodeBg.Height;
            float y2 = nodeBg.Height + 35;
            float x2 = lCenter;
            var h = Math.Abs(y2 - y1);
            var w = Math.Abs(x2 - x1);
            if (lNodeImg != null)
            {
                g.DrawImage(lNodeImg, 0, nodeBg.Size.Height + 35);
                var points1 = new List<PointF>
{
new PointF(x1, y1),
new PointF(x1 - w/6, y1 + h/3.5f),
new PointF(x2 + w/6, y2 - h/3.5f),
new PointF(x2, y2),
};
                g.DrawCurve(pen, points1.ToArray(), 0.5f);
            }
            if (rNodeImg != null)
            {
                g.DrawImage(rNodeImg, lSize.Width, nodeBg.Size.Height + 35);
                x2 = rCenter + lSize.Width;
                w = Math.Abs(x2 - x1);
                var points = new List<PointF>
{
new PointF(x1, y1),
new PointF(x1 + w/6, y1 + h/3.5f),
new PointF(x2 - w/6, y2 - h/3.5f),
new PointF(x2, y2)
};

            g.DrawCurve(pen, points.ToArray(), 0.5f);
            }
            return result;
        }
        public bool Exists(int value)
        {
            bool res = value == this.value;
            if (!res && left != null)
                res = left.Exists(value);
            if (!res && right != null)
                res = right.Exists(value);
            return res;
        }
    }
}
```

OUTPUT:


Form1
Add
Remove
Create
Search


Form1
5
3
7
2
4
6
8
1
8
Add
Remove
Create
Search