# MANGALORE UNIVERSITY

# MASTER OF SCIENCE
# IN
# COMPUTER SCIENCE

**CSP108: .NET TECHNOLOGY LAB**


**SUBMITTED**
**BY**
I SEMESTER MSC
Computer Science Students

**SUBMITTED**
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| .NET TECHNOLOGY PROGRAM | | |
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**1. Write a C# program to print Fibonacci series without using recursion and using recursion.**

```
using System;
namespace Exercises
{
class Fibonacci
{
	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 Prime number.**

```
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:5
Number is Prime.
```

```
Enter the Number to check Prime:56
Number is not Prime.
```

**3.Write a C# program to check palindrome number.**

```
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.Write("Number is Palindrome.");
            else
                  Console.Write("Number is not Palindrome.");
      }
}
}
```

**OUTPUT:**

```
Enter the Number:1221
Number is Palindrome.
```

```
Enter the Number:2345
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.Write("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=370
Armstrong Number
```

```
Enter the Number=56
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.Write("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);
	}
}
}
```

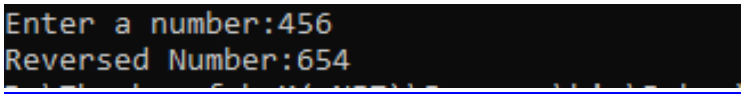
**OUTPUT:**

```
Enter a number:675
Sum is=18
```

**7.Write a C# program to Reverse 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:**



**8. Write a C# program to print a Binary Triangle.**

```
using System;
namespace Exercises
{
class BinaryTriangle
{
	static void Main(string[] args)
	{
		int number, digit = 1;<br>
		Console.Write("\nEnter 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. Write a C# program to check whether the entered number is an Amicable Number or Not.**

```
using System;
namespace Exercises
{
class AmicableNumber
{
	static void Main(string[] args)
	{
		int num1, num2, sum1 = 0, sum2 = 0;
		Console.WriteLine("\n----------AMICABLE NUMBER--------\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 NUMBER--------

Enter the first number:220

Enter the second number:284

The numbers 220 and 284 are amicable.
```

```
-----------AMICABLE NUMBER--------

Enter the first number:330

Enter the second number:400

The numbers 330 and 400 are not amicable.
```

**10. Write a C# program to illustrate Multilevel Inheritance with virtual Methods (displaying student details).**

```
using System;
namespace Exercises
{
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 Number        :" + 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 = "First Class";
                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("Total           :" + total);
                        Console.WriteLine("Average         :" + average);
                        Console.WriteLine("Grade           :" + grade);

                }
        }
        class MultiLevel
        {
                public static void Main(string[] args)
                {
                        MarksDetails Student1 = new MarksDetails("Abjhijith", 22, "Male", 20190001,
"MCA", 5, new int[] { 77, 80, 98, 95, 90 });
                        Student1.Display();
                }
        }
}
```

**OUTPUT:**

```
.....PERSONAL DETAILS.....

Name    :Thashreefah M
Age     :22
Gender  :Female

.....COURSE DETAILS.....

Register Number    :34
Course             :MSc
Semester           :5

.....MARKS DETAILS.....

Marks in 5 subjects:77 80 98 95 90
Total      :440
Average    :88
Grade      :Distinction
```

**11.Write a 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("\nEnter the decimal number:");
		InputNum = Convert.ToInt32(Console.ReadLine());
		Console.WriteLine("\nBinary equivalent of {0}:{1}", InputNum,
Convert.ToString(InputNum, 2));
		GrayNum = getGray(InputNum);
		Console.WriteLine("\nGray Code equivalent of {0}:{1}", InputNum,
Convert.ToString(GrayNum, 2));
	}
}
}
```

**OUTPUT:**

```
Enter the decimal number:123

Binary equivalent of 123:1111011

Gray Code equivalent of 123:1000110
```

**12.Write a 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 = length;
	}
	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 width:10,height:20 and length:30 is:6000
Volume of box with width:25,height:32 and length:15 is:12000
Volume after adding boxes:18000
```

**13.Write a C# program to Implement principles 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));
}
}
```

**OUTPUT:**

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

**14. Write a 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:**

```
student 77:20210077
student 78:20210078
student 79:20210079
student 80:20210080
student 81:20210081
student 82:20210082
student 83:20210083
student 84:20210084
student 85:20210085
student 86:20210086
student 87:20210087
student 88:20210088
student 89:20210089
student 90:20210090
student 91:20210091
student 92:20210092
student 93:20210093
student 94:20210094
student 95:20210095
student 96:20210096
student 97:20210097
student 98:20210098
student 99:20210099
student 100:20210100
```

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

```
using System;
namespace Exercises
{
class FrequencyIS
{
  static void Main(string[] args)
      {
            int count = 0;
            string inputString;
            Console.WriteLine("\n-------------Frequency of word 'is'----------");
            Console.Write("\nEnter 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("\nNumber of 'is' in '" + inputString + "' is:" + count);
      }
}
}
```

**OUTPUT:**

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

Enter the input string:My Name is Is Is iS Thashreefah M
my
name
is
is
is
is
thashreefah
m

Number of 'is' in 'My Name is Is Is iS Thashreefah M' is:4
```

**16. Write a 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("\nTime taken for allocation in case of 2D array:");
            Console.WriteLine(Stopwatch2D.Elapsed.TotalMilliseconds+"milliseconds");
            Console.Write("\nTime taken for allocation in case of Jagged array:");
            Console.WriteLine(StopwatchJagged.Elapsed.TotalMilliseconds + "milliseconds");
        }
}
}
```

**OUTPUT:**

```
Time taken for allocation in case of 2D array:3334.8255milliseconds

Time taken for allocation in case of Jagged array:3011.4933milliseconds
```

**17. Write a C# program to find the Sum of the values on Diagonal of the Matrix.**

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

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

**OUTPUT:**

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

Enter the number of rows:3

Enter the numbers 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 MATRIX------

Enter the number of rows:3

Enter the numbers of columns:4

The Dimensional entered are not of Square Matrix

Exiting the Program
```

**18. Write a C# program to Create a file, check the existence of a file and read the content 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("\n1.Create a File");
			Console.WriteLine("\n2.Existence of the File");
			Console.WriteLine("\n3.Read the content of the File");
			Console.WriteLine("\n4.Exit");
			Console.Write("\nEnter your choice:");
			int ch = int.Parse(Console.ReadLine());
			switch(ch)
			{
				case 1:
					Console.Write("\nEnter the file name to create:");
					fileName = Console.ReadLine();
					Console.Write("\nWrite the content of 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("\nEnter the file name:");
					fileName = Console.ReadLine();
					if(File.Exists(fileName))
					{
						Console.WriteLine("File exists...");
```

```
                    }
                    else
                    {
                        Console.WriteLine("File does not exist in the current directory!");
                    }
                    break;
                case 3:
                    Console.Write("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("\nExisting....");
                    return;
                default:
                    Console.WriteLine("\nInvalid choice");
                    break;
            }
        }
    }
}
}
```

**OUTPUT:**

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


1.Create a File

2.Existence of the File

3.Read the content of the File

4.Exit

Enter your choice:1

Enter the file name to create:thash.txt

Write the content of the file:
My name is Thashreefah M
File is created

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


1.Create a File

2.Existence of the File

3.Read the content of the File

4.Exit

Enter your choice:2

Enter the file name:thash.txt
File exists...

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


1.Create a File

2.Existence of the File

3.Read the content of the File

4.Exit

Enter your choice:2

Enter the file name:sadi.txt
File does not exist in the current directory!
```

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


1.Create a File

2.Existence of the File

3.Read the content of the File

4.Exit

Enter your choice:3
Enter the file name to read the contents:
thash.txt
Here is the content of the file:
My name is Thashreefah M


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


1.Create a File

2.Existence of the File

3.Read the content of the File

4.Exit

Enter your choice:3
Enter the file name to read the contents:
sadi.txt
File does not exists

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


1.Create a File

2.Existence of the File

3.Read the content of the File

4.Exit

Enter your choice:4

Existing....
```

**19. Write a C# program to perform File comparison.**

```
using System;
using System.IO;
namespace Exercises
{
class FileRead1
{
	public 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:\Thashreefah M(.NET)\file1.txt
Enter the second file path:D:\Thashreefah M(.NET)\file2.txt
Both files contain the same content
```

```
Enter the first file path:D:\Thashreefah M(.NET)\file1.txt
Enter the second file path:D:\Thashreefah M(.NET)\file3.txt
Contents of files are not same
```

**20. Write a 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. Write a 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 executing");
		}
	}
	public void ThreadFun2(object obj)
	{
		int loop = 0;

		for (loop = 0; loop <= 4; loop++)
		{
			Console.WriteLine("Thread2 is executing");
		}
	}
	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 executing
Thread2 is executing
Thread2 is executing
Thread1 is executing
Thread1 is executing
Thread1 is executing
Thread2 is executing
Thread2 is executing
Thread1 is executing
Thread1 is executing
Thread1 is executing
Thread1 is executing
Thread1 is executing
Thread2 is executing
Thread2 is executing
Thread2 is executing
Thread2 is executing
Thread2 is executing
Thread1 is executing
Thread1 is executing
```

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

```
using System;
namespace Exercises
{
class ExceptionlHandling
{
	static void Main(string[] args)
	{
		Age a = new Age();
			try
		{
			a.displayAge();
		}
		catch (AgeIsNegativeException e)
		{
			Console.WriteLine("AgeIsNegativeException:{0}", e.Message);
		}
		finally
		{
			Console.WriteLine("Execution 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);
```

```
    }
}
}
```

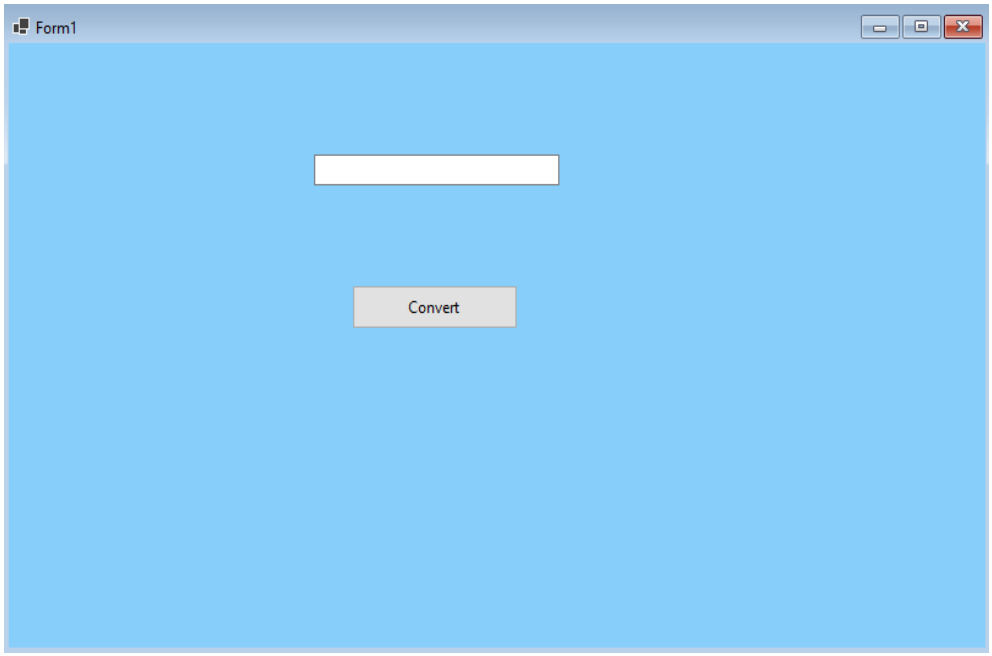
**OUTPUT:**

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

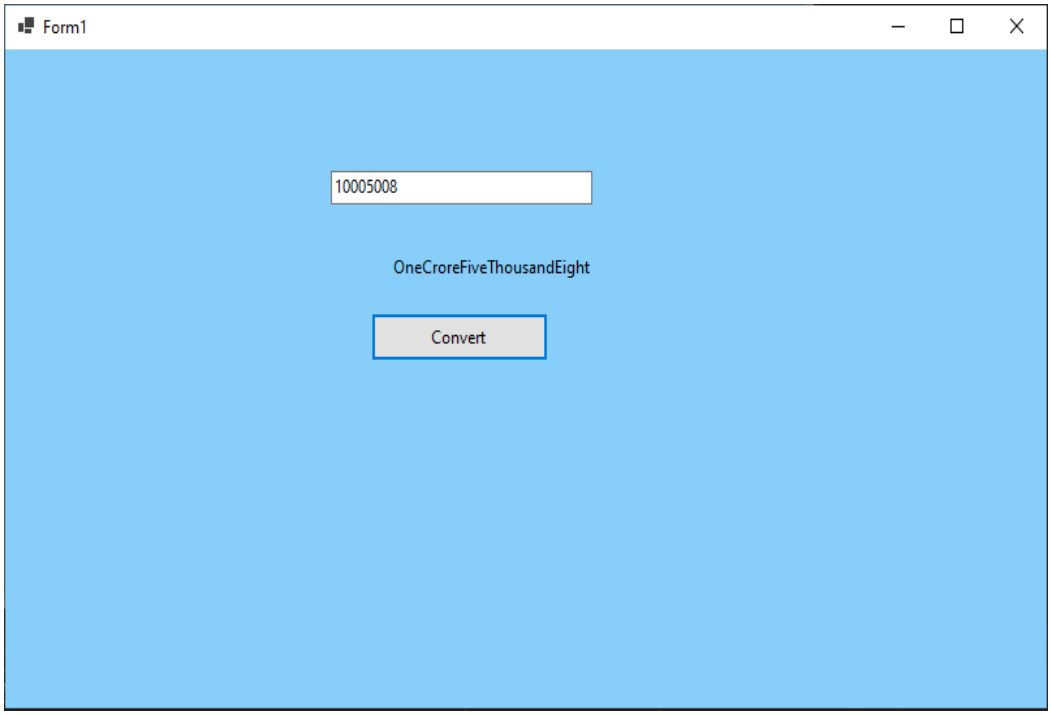
**23. Write a C# Program to Convert digits to words using Windows Forms application.**

```
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) + "Lakhs";
                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", "Eleven", "Twelve", "Thirteen", "Fourteen", "Fifteen", "Sixteen",
"Seventeen", "Eighteen", "Nineteen" };
                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;
        }
}
}
```


Form1
Convert

**OUTPUT:**

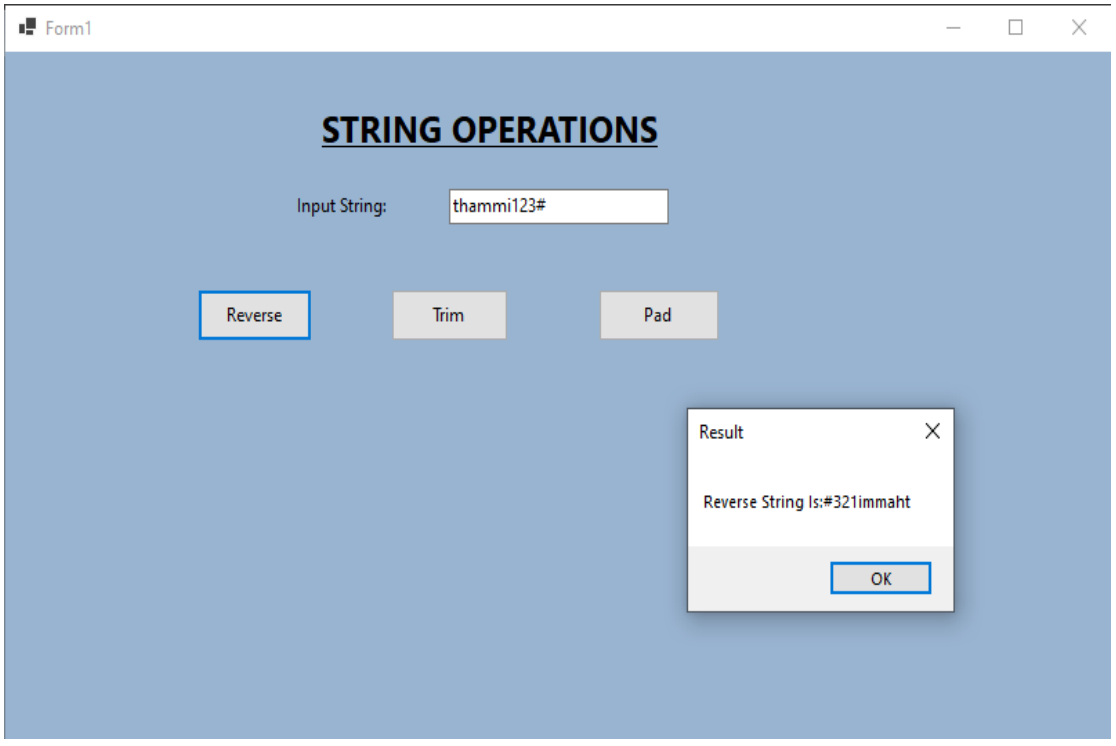

Form1
10005008
OneCroreFiveThousandEight
Convert

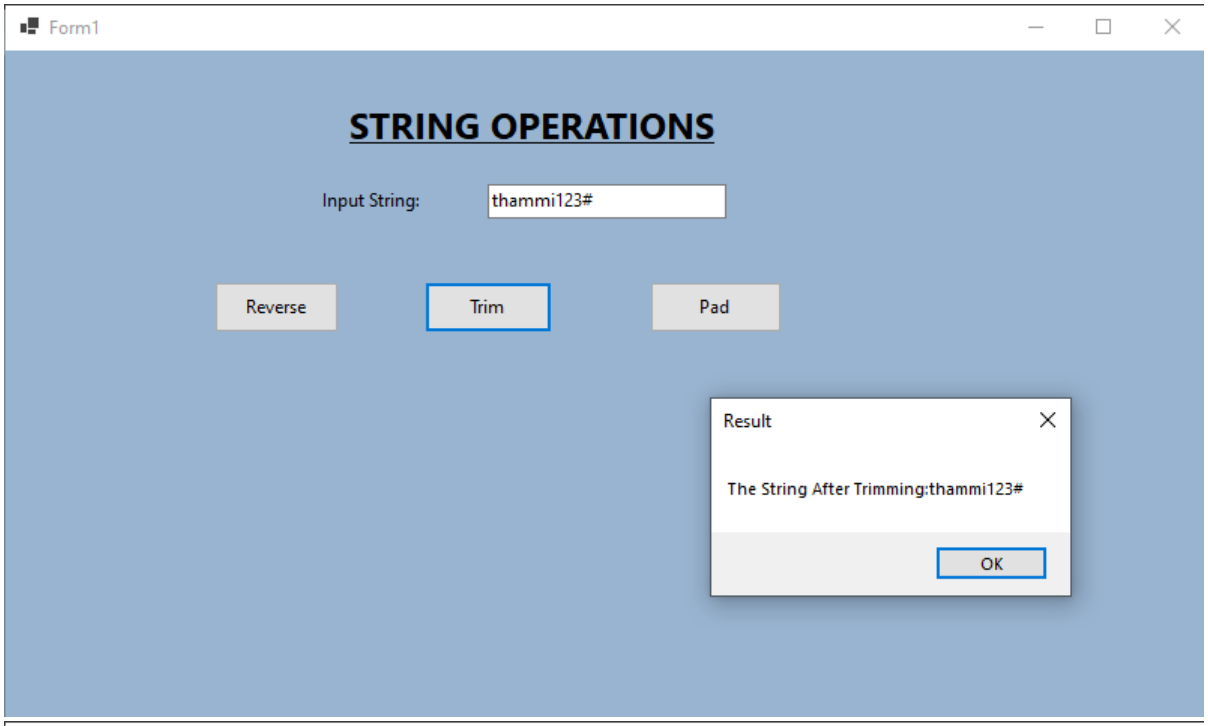
**24.Write a C# program to perform Reversal, Padding and Trimming Operations on string using Windows Forms application.**

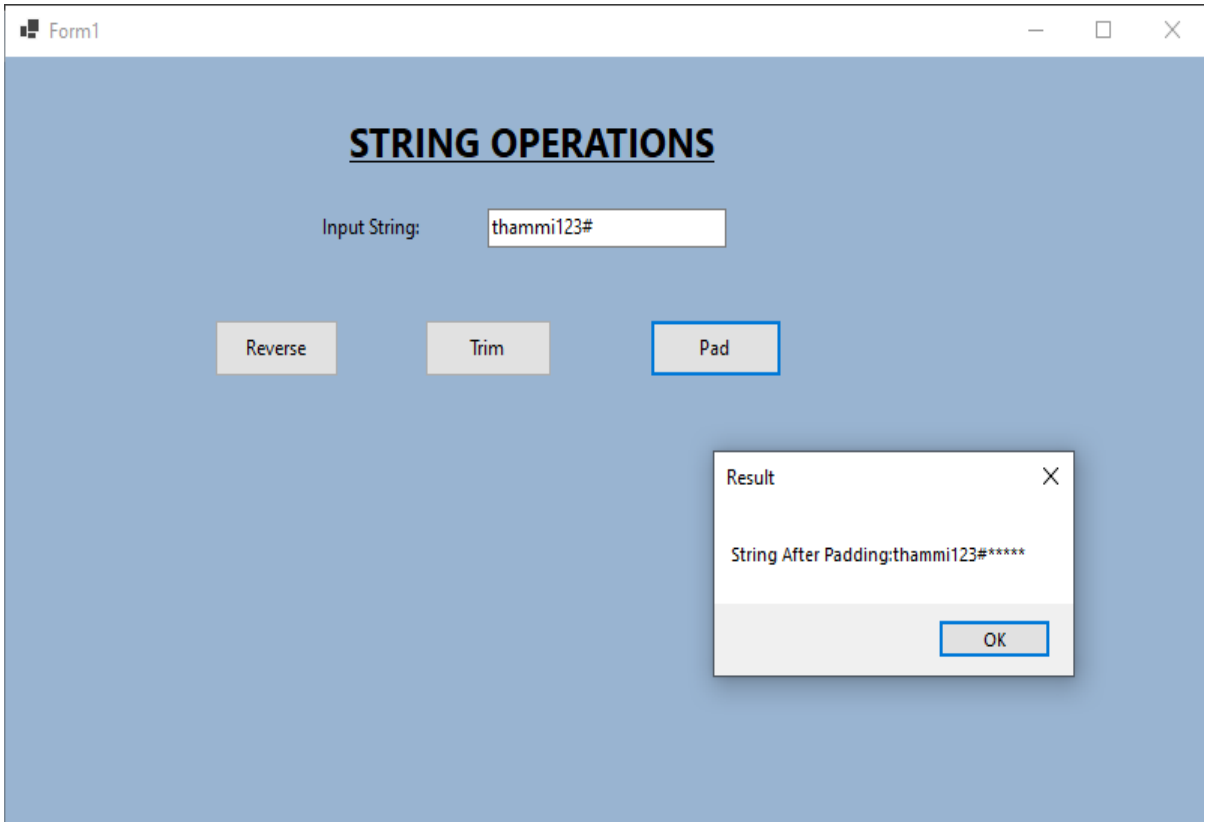
```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;
namespace program2
{
public partial class Form1 : Form
{
	public Form1()
	{
		InitializeComponent();
	}

	private void button1_Click(object sender, EventArgs e)
	{
		string inputString, revstr = "";
		int Length;
		inputString = textBox1.Text;
		Length = inputString.Length - 1;
		while (Length >= 0)
		{
			revstr = revstr + inputString[Length];
			Length--;
		}
			MessageBox.Show("Reverse String Is:" + revstr, "Result");
		}

	private void button2_Click(object sender, EventArgs e)
	{
			string inputString;
			inputString = textBox1.Text;
			MessageBox.Show("The String After Trimming:" + inputString.Trim(), "Result");
	}
```

```
        private void button3_Click(object sender, EventArgs e)
        {
            string inputString;
            inputString = textBox1.Text;
            inputString = inputString.PadLeft(10, '*');
            inputString = inputString.PadRight(15, '*');
            MessageBox.Show("String After Padding:" + inputString, "Result");
        }
}}
```


**OUTPUT:**




Form1
STRING OPERATIONS
Input String:
thammi123#
Reverse
Trim
Pad
Result
The String After Trimming:thammi123#
OK

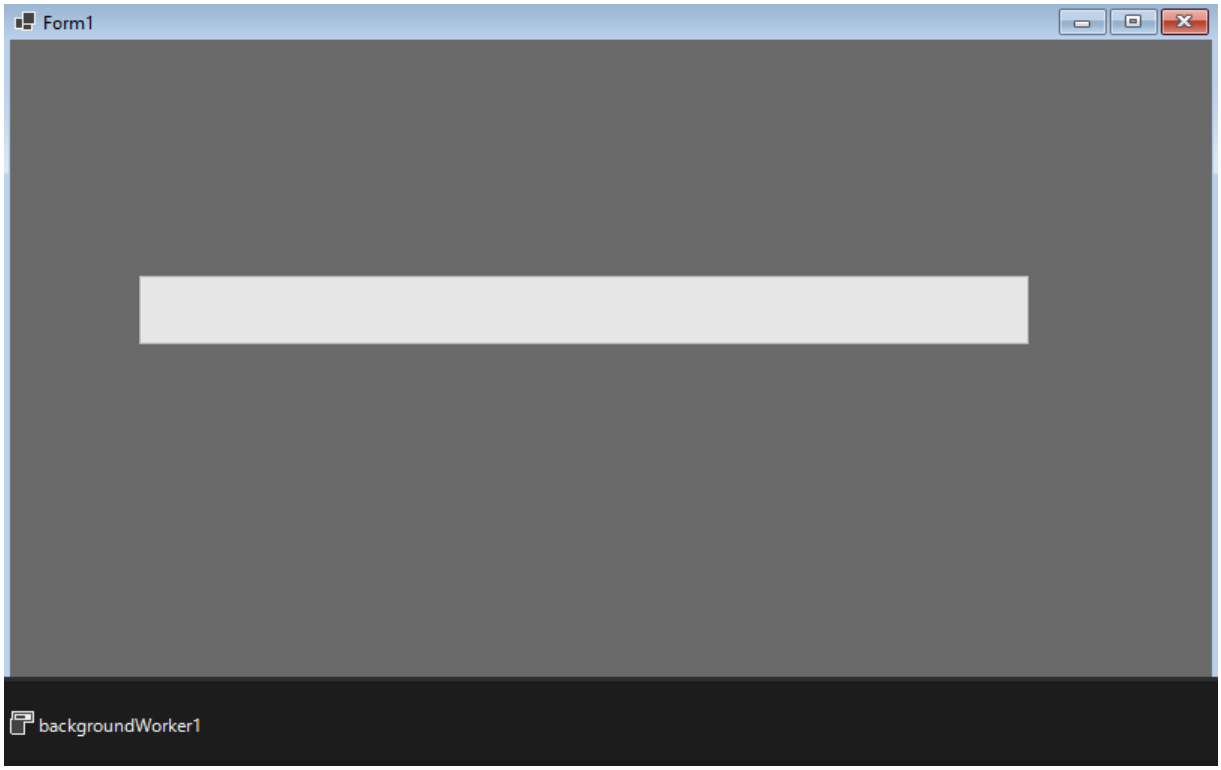

Form1
STRING OPERATIONS
Input String:
thammi123#
Reverse
Trim
Pad
Result
String After Padding:thammi123#*****
OK

**25.Write a C# Program to create a Progress bar Control using Windows Forms application.**

```
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.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 = "Progress:" + e.ProgressPercentage.ToString() + "%";
```

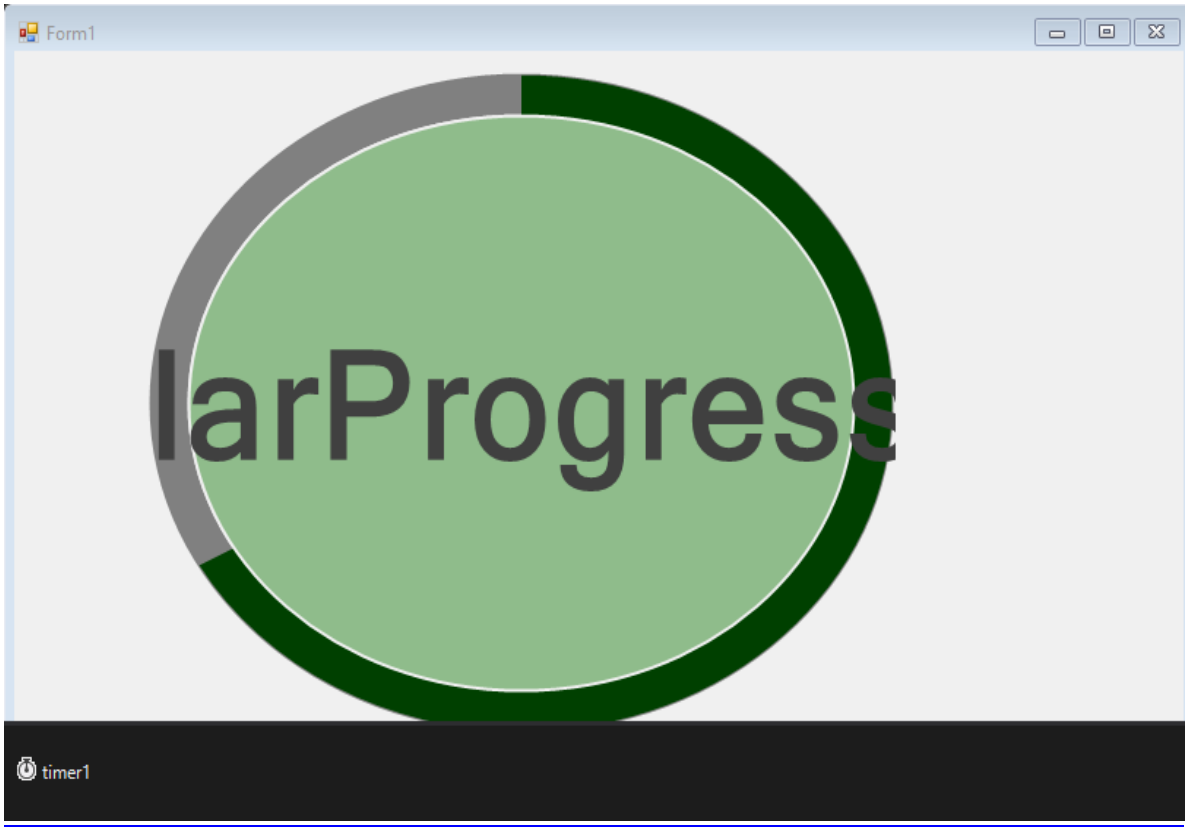
```
        }
}
}
```

**OUTPUT:**

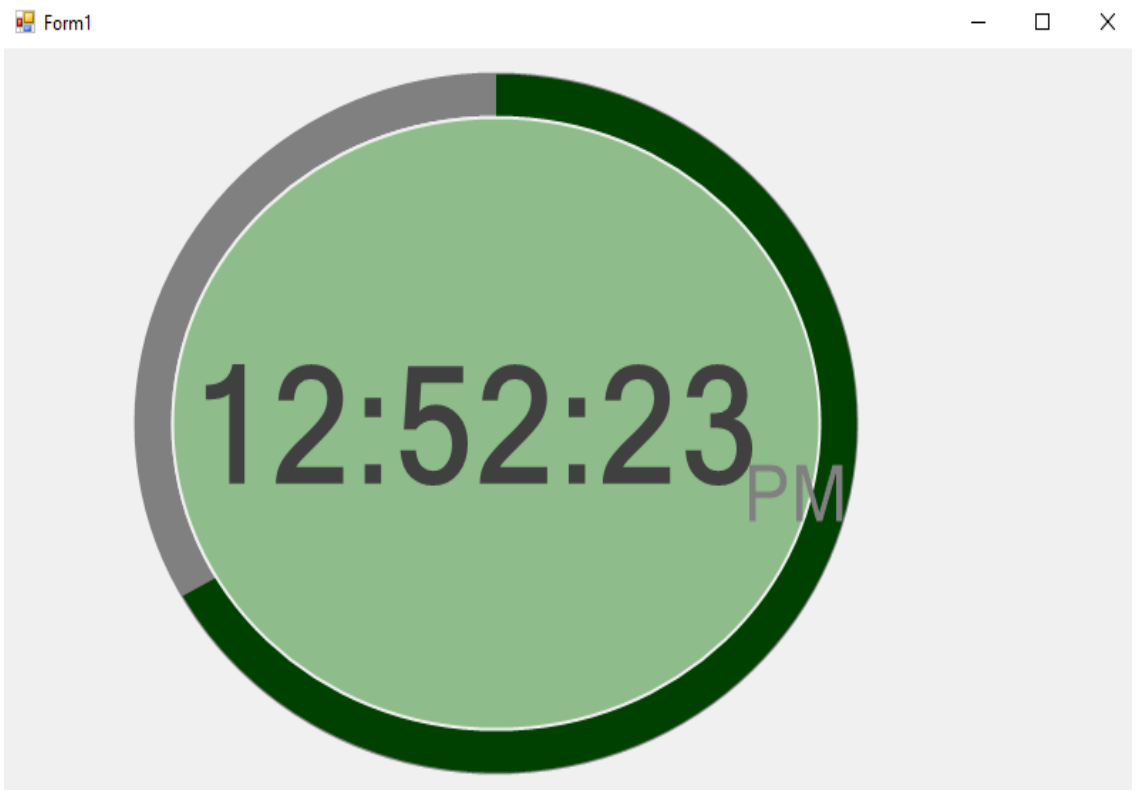



**26.Write a C# program to create a Flat Clock using Windows Forms application.**

```
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();
		timer1.Start();
	}

	private void Form1_Load(object sender, EventArgs e)
	{
		System.Timers.Timer timer = new System.Timers.Timer();
		timer.Interval = 1000;
		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");//AM or PM
		});
	}
}
}
```




**OUTPUT:**

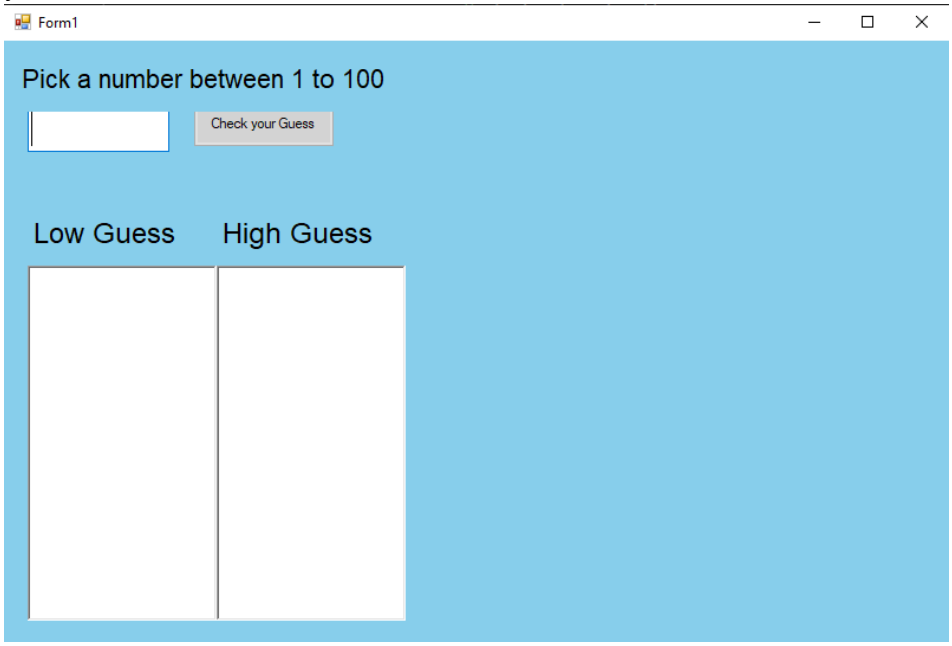


**27.Write a C# Program to perform a number guessing game using Windows Forms application.**

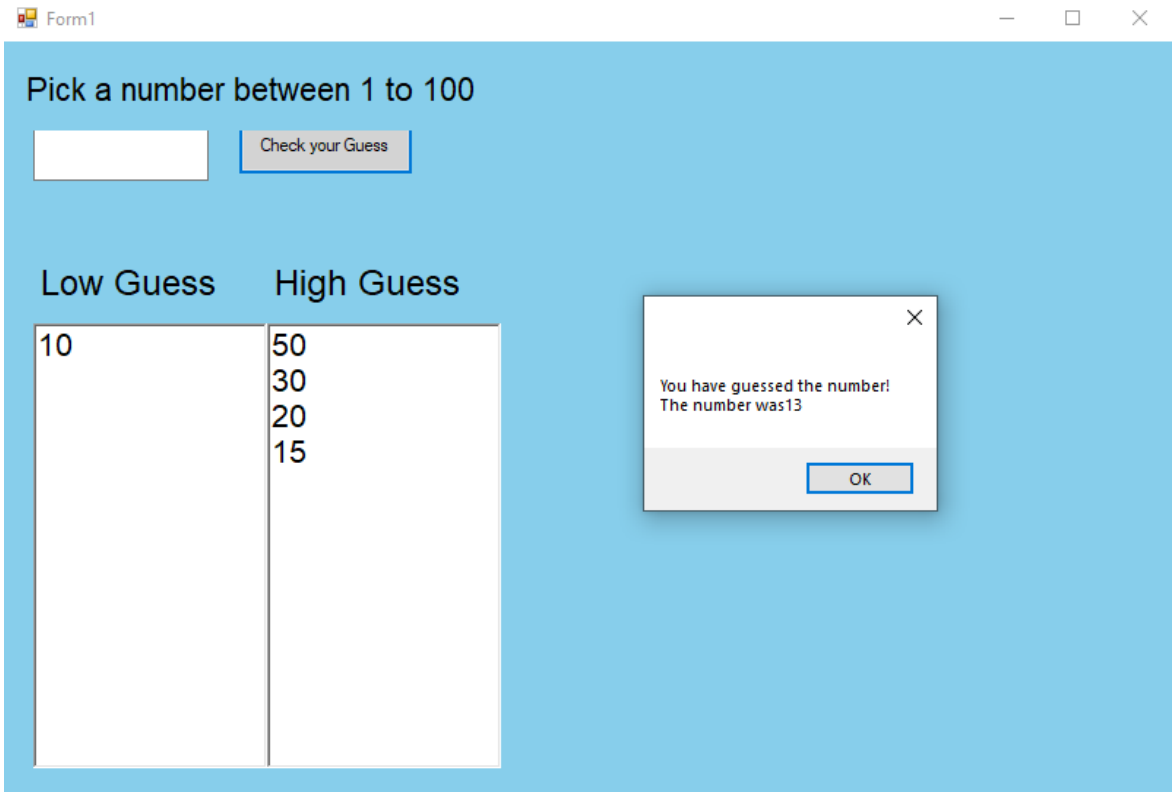
```
using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Linq;
using System.Text;
using System.Threading.Tasks;
using System.Windows.Forms;
namespace program6._1
{
public partial class Form1 : Form
{
        static Random r = 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 to 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!\nThe 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);
            }
        }
}
}
```



**OUTPUT:**


Form1
Pick a number between 1 to 100
Check your Guess
Low Guess
High Guess
10
50
30
20
15
You have guessed the number!
The number was13
OK

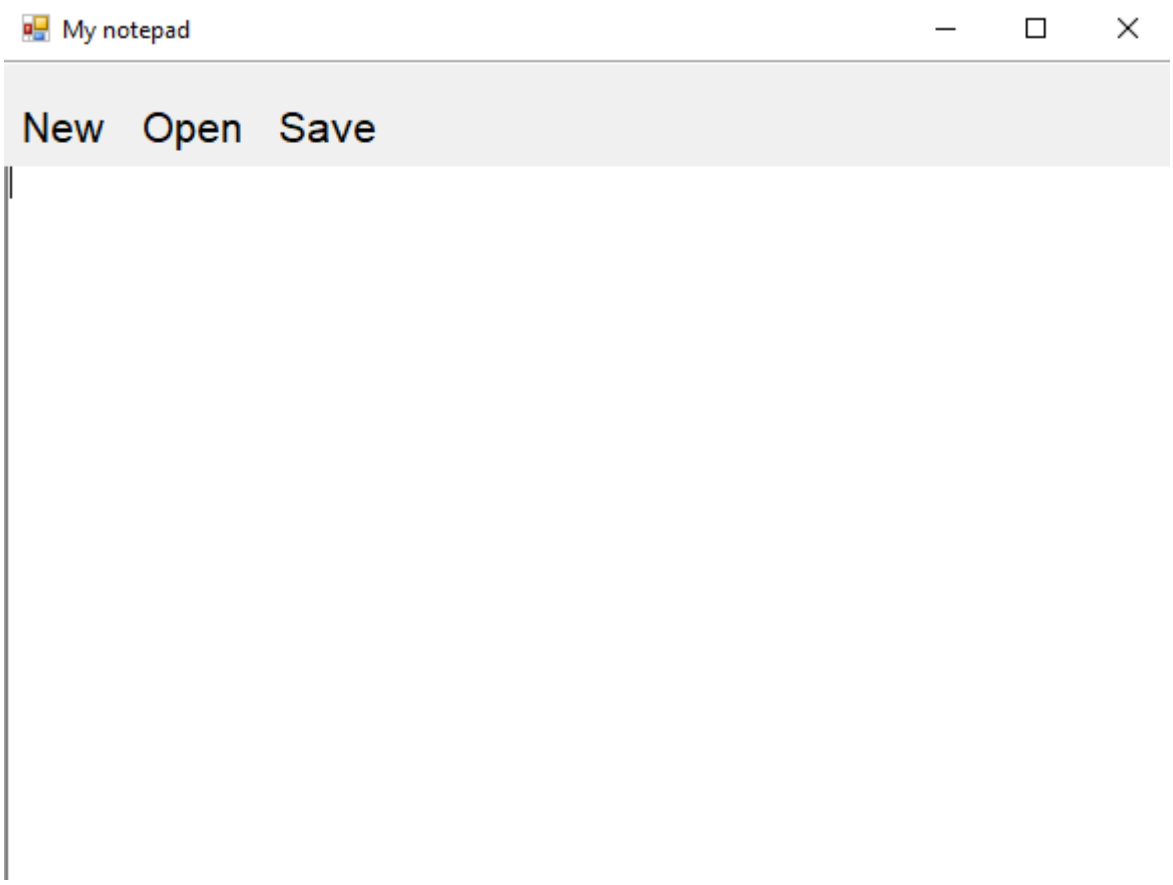
**28.Write a C# program to to create a notepad using Windows Forms application.**

```
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 program7
{
public partial class Form1 : Form
{
	private string fileName;
	private RichTextBox txtContent;
	private ToolBar toolBar;
	public 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();
}

/*static void Main(string[] args)
{
        Application.Run(new Form1());
}*/

private void Form1_Load(object sender, EventArgs e)
{

}
}
  }
```

**OUTPUT:**



**29.Write a C# program to construct a graphical binary tree where you need to Create, Add, Search and Remove nodes using Windows Forms application.**

```
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 program8
{
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 button3_Click(object sender, EventArgs e)
    {
        root = null;
        pictureBox1.Image = null;
    }

    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 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";
```

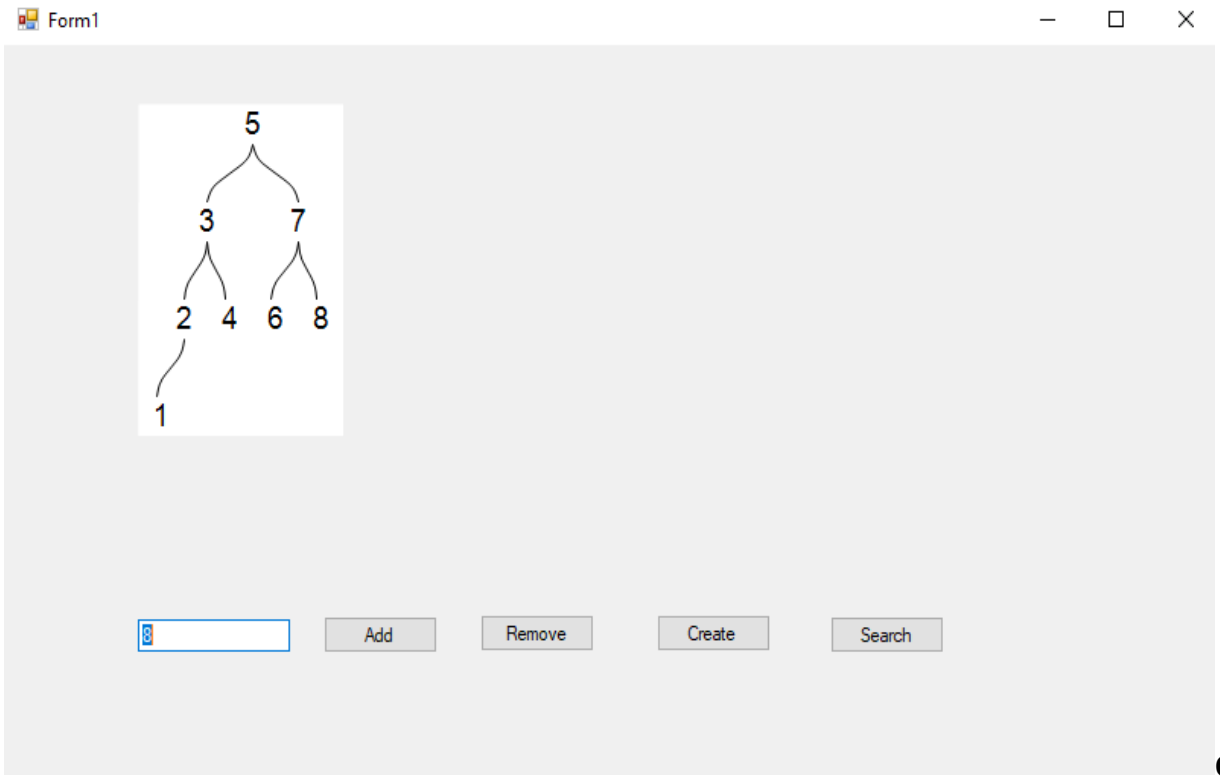
```
                }
                else
                {
                        msg = "Value not found";
                }
        }
        MessageBox.Show(msg);
    }

    void drawTree()
    {
        if (root != null)
                pictureBox1.Image = root.Draw();
        else
                pictureBox1.Image = null;
        this.Update();
    }
    // static void Main()
    // {
    //          Application.Run(new Form1());
    //}
}
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();
```

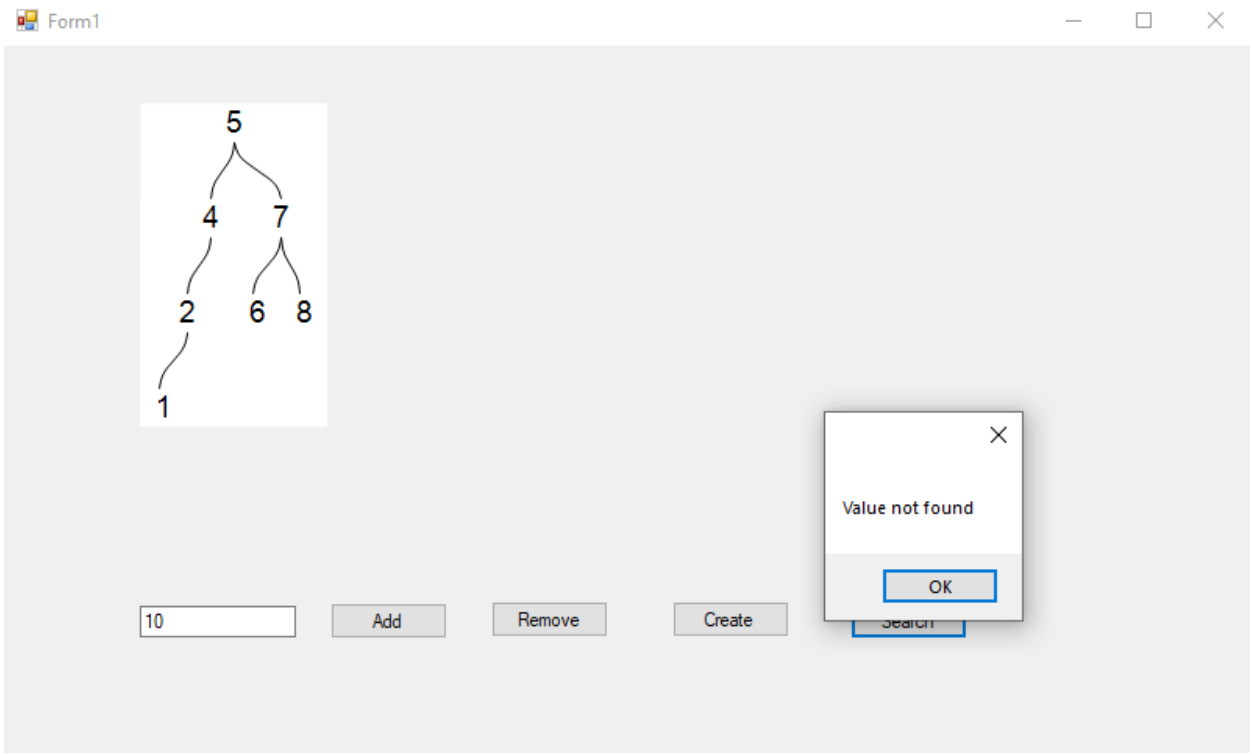
```
            rSize = rNodeImg.Size;
            rCenter = right.center;
        }
        int maxHeight = (lSize.Height < rSize.Height) ? rSize.Height : lSize.Height;
        if (maxHeight > 0)
            maxHeight += 35;


        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;
        }
}
}
```




**O**

**OUTPUT:**



**30.Write a C# program to perform money conversion using Windows Forms application.**

```
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 moneyconvertion
{
    public partial class Form1 : Form
    {
        public Form1()
        {
            InitializeComponent();
        }
        private void button1_Click(object sender, EventArgs e)
        {
            {
                label4.Visible = true;
                if (textBox1.Text == "")
                {
                    label4.Text = "Enter the amount";
                }
                else
                {
                    Double convertedamt = Convert.ToDouble(textBox1.Text);
                    if (comboBox1.SelectedItem== "INR" && comboBox2.SelectedItem
== "USD")
                    {
                        Double a = convertedamt / 74;
                        label4.Text = a + "$";
                    }
                    else if (comboBox1.SelectedItem == "INR" &&
comboBox2.SelectedItem == "SAR")
                    {
                        Double a = convertedamt / 17;
                        label4.Text = a + "SAR";
                    }
                    else if (comboBox1.SelectedItem== "INR" &&
comboBox2.SelectedItem == "EUR")
                    {
```

```
                        Double a = convertedamt / 11;
                        label4.Text = a + "EUR";
                    }
                    else
                    {
                        label4.Text = "Please Enter the conversion code";
                    }
                }
            }
        }

        private void button2_Click(object sender, EventArgs e)
        {
            textBox1.Text = "";
            label4.Text = "";


        }
    }
}
```