CS 312 – Project 1 – Primality Testing
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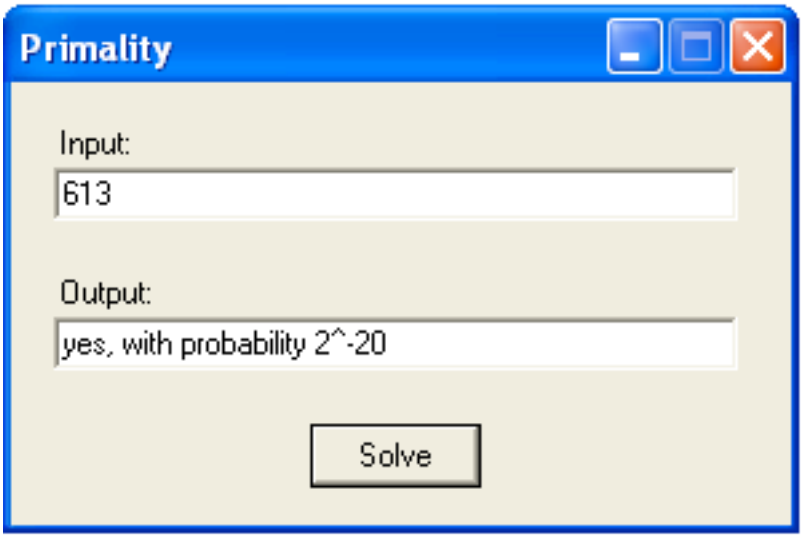
Screenshot of Primality Test



Code Listing of Form1.cs

```
using System;
using System.Drawing;
using System.Collections;
using System.ComponentModel;
using System.Windows.Forms;
using System.Data;

namespace Primality
{
   /// <summary>
   /// Summary description for Form1.
   /// </summary>
   public class PrimalityForm : System.Windows.Forms.Form
   {
      private System.Windows.Forms.TextBox input;
      private System.Windows.Forms.Label label1;
      private System.Windows.Forms.TextBox output;
      private System.Windows.Forms.Label label2;
      private System.Windows.Forms.Button solve;
      /// <summary>
      /// Required designer variable.
      /// </summary>
      private System.ComponentModel.Container components = null;
```

```
public PrimalityForm()
{
   //
   // Required for Windows Form Designer support
   //
   InitializeComponent();

   //
   // TODO: Add any constructor code after InitializeComponent call
   //
}

/// <summary>
/// Clean up any resources being used.
/// </summary>
protected override void Dispose( bool disposing )
{
   if( disposing )
   {
      if (components != null)
      {
         components.Dispose();
      }
   }
   base.Dispose( disposing );
}

#region Windows Form Designer generated code
/// <summary>
/// Required method for Designer support - do not modify
/// the contents of this method with the code editor.
/// </summary>
private void InitializeComponent()
{
   this.input = new System.Windows.Forms.TextBox();
   this.output = new System.Windows.Forms.TextBox();
   this.solve = new System.Windows.Forms.Button();
   this.label1 = new System.Windows.Forms.Label();
   this.label2 = new System.Windows.Forms.Label();
   this.SuspendLayout();
   //
   // input
   //
   this.input.Location = new System.Drawing.Point(16, 32);
   this.input.Name = "input";
   this.input.Size = new System.Drawing.Size(256, 20);
   this.input.TabIndex = 0;
```

```
        this.input.Text = "";
        //
        // output
        //
        this.output.Location = new System.Drawing.Point(16, 88);
        this.output.Name = "output";
        this.output.Size = new System.Drawing.Size(256, 20);
        this.output.TabIndex = 1;
        this.output.Text = "";
        //
        // solve
        //
        this.solve.Location = new System.Drawing.Point(112, 128);
        this.solve.Name = "solve";
        this.solve.Size = new System.Drawing.Size(64, 24);
        this.solve.TabIndex = 2;
        this.solve.Text = "Solve ";
        this.solve.Click += new System.EventHandler(this.button1_Click);
        //
        // label1
        //
        this.label1.Location = new System.Drawing.Point(16, 16);
        this.label1.Name = "label1";
        this.label1.Size = new System.Drawing.Size(96, 16);
        this.label1.TabIndex = 3;
        this.label1.Text = "Input:";
        //
        // label2
        //
        this.label2.Location = new System.Drawing.Point(16, 72);
        this.label2.Name = "label2";
        this.label2.Size = new System.Drawing.Size(72, 16);
        this.label2.TabIndex = 4;
        this.label2.Text = "Output:";
        //
        // PrimalityForm
        //
        this.AutoScaleBaseSize = new System.Drawing.Size(5, 13);
        this.ClientSize = new System.Drawing.Size(292, 166);
        this.Controls.Add(this.label2);
        this.Controls.Add(this.label1);
        this.Controls.Add(this.solve);
        this.Controls.Add(this.output);
        this.Controls.Add(this.input);
        this.FormBorderStyle =
System.Windows.Forms.FormBorderStyle.FixedDialog;
        this.MaximizeBox = false;
        this.Name = "PrimalityForm";
```

```
   this.Text = "Primality";
   this.Load += new System.EventHandler(this.PrimalityForm_Load);
   this.ResumeLayout(false);

}
#endregion

/// <summary>
/// The main entry point for the application.
/// </summary>
[STAThread]
static void Main()
{
   Application.Run(new PrimalityForm());
}

private int modExp(int x, int y, int N)
{
   if (y == 0) return 1;
   int z = modExp(x, y/2, N);
   if (y % 2 == 0)
      return z*z % N;
   else
      return x*z*z % N;
}

private bool isPrime(int N, int k)
{
   Random rnd = new Random();
   for (int i = 0; i < k; i++)
   {
      int a = rnd.Next(N - 1) + 1;
      int p = modExp(a, N-1, N); //a ^ (N - 1); //Power(a, N - 1);
      if (p % N != 1) return false;
   }
   return true;
}

private void button1_Click(object sender, System.EventArgs e)
{
   int k = 20;
   if (isPrime(Convert.ToInt32(input.Text), k))
      output.Text = String.Format("yes, with probability 2^-{0}",k);
   else
      output.Text = "no";
}

private void PrimalityForm_Load(object sender, System.EventArgs e)
```

```
      {

      }

   }
}
```

Formula for Probability:

1 ^ -k (one to the power of negative k)