МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ
федеральное государственное автономное образовательное учреждение высшего образования
«САНКТ-ПЕТЕРБУРГСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ АЭРОКОСМИЧЕСКОГО ПРИБОРОСТРОЕНИЯ»

КАФЕДРА №34

ОТЧЕТ ЗАЩИЩЕН С ОЦЕНКОЙ_____

ПРЕПОДАВАТЕЛЬ

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ОТЧЕТ О ЛАБОРАТОРНОЙ РАБОТЕ № 3

ИСПОЛЬЗОВАНИЕ РЕКУРСИВНЫХ ПОДПРОГРАММ ПРИ ПОСТРОЕНИИ ФРАКТАЛЬНЫХ СТРУКТУР

по курсу: ТЕХНОЛОГИИ И МЕТОДЫ ПРОГРАММИРОВАНИЯ

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Цель: Получить навыки работы с основными инструментами среды программирования Microsoft Visual Studio 2019. Создать программу с использованием Windows Forms на языках C#, C++, C.

Часть 1.

Вариант №5

1. Дано натуральное число:

1.1 найти первую и последнюю цифры числа;

1.2 определить, верно ли, что сумма цифр данного числа равна A (A вводится с клавиатуры).

2. Найти все трехзначные числа, которые при делении на 2 дают остаток 1, при

делении на 3 - остаток 2, при делении на 4 - остаток 3, а само число делится на

3) Создать консольный и Windows Forms проекты. выполняющие,

поразрядное сложение двух строк (вашей фамилии и имени) с выводом

промежуточных результатов.

4.Листинг Windows forms программы:

form1.cs

```
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 lab_1_win_forms
{
  public partial class Form1 : Form
  {
    public Form1()
    {
      InitializeComponent();
    }

    private void button1_Click(object sender, EventArgs e)
    {
      int first, last, sum, input1, input2;
      sum = 0;
      input1 = (int)numericUpDown1.Value;
      input2 = (int)numericUpDown2.Value;
      last = input1 % 10;
      first = input1;
      while (first > 1)
      {
        first /= 10;
        sum += first;
      }
      richTextBox1.Text += "Первое число "+ first + '\n' + "Последнее число " + last+ '\n';
      sum = first + last;
      if (input2 == sum)
      {
        richTextBox1.Text += "Сумма цифр равна ";
      }
      else
      {
        richTextBox1.Text += "Сумма цифр не равна ";
      }
    }
  }
}
```

form1.designer.cs

```
namespace lab_1_win_forms
{
  partial class Form1
  {
    /// <summary>
    /// Required designer variable.
    /// </summary>
    private System.ComponentModel.IContainer components = null;

    /// <summary>
    /// Clean up any resources being used.
    /// </summary>
    /// <param name="disposing">true if managed resources should be disposed; otherwise, false.</param>
    protected override void Dispose(bool disposing)
    {
      if (disposing && (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.numericUpDown2 = new System.Windows.Forms.NumericUpDown();
      this.button1 = new System.Windows.Forms.Button();
      this.numericUpDown1 = new System.Windows.Forms.NumericUpDown();
      this.richTextBox1 = new System.Windows.Forms.RichTextBox();
      this.Label = new System.Windows.Forms.Label();
      this.label1 = new System.Windows.Forms.Label();
      ((System.ComponentModel.ISupportInitialize)(this.numericUpDown2)).BeginInit();
      ((System.ComponentModel.ISupportInitialize)(this.numericUpDown1)).BeginInit();
      this.SuspendLayout();
      //
      // numericUpDown2
```

```
//
this.numericUpDown2.Location = new System.Drawing.Point(192, 62);
this.numericUpDown2.Name = "numericUpDown2";
this.numericUpDown2.Size = new System.Drawing.Size(120, 23);
this.numericUpDown2.TabIndex = 1;
//
// button1
//
this.button1.Location = new System.Drawing.Point(140, 107);
this.button1.Name = "button1";
this.button1.Size = new System.Drawing.Size(75, 23);
this.button1.TabIndex = 2;
this.button1.Text = "button1";
this.button1.UseVisualStyleBackColor = true;
this.button1.Click += new System.EventHandler(this.button1_Click);
//
// numericUpDown1
//
this.numericUpDown1.Location = new System.Drawing.Point(33, 62);
this.numericUpDown1.Maximum = new decimal(new int[] {
-1,
0,
0,
0});
this.numericUpDown1.Name = "numericUpDown1";
this.numericUpDown1.Size = new System.Drawing.Size(120, 23);
this.numericUpDown1.TabIndex = 0;
//
// richTextBox1
//
this.richTextBox1.Location = new System.Drawing.Point(470, 33);
this.richTextBox1.Name = "richTextBox1";
this.richTextBox1.Size = new System.Drawing.Size(308, 389);
this.richTextBox1.TabIndex = 3;
this.richTextBox1.Text = "";
//
// Label
//
this.Label.AutoSize = true;
this.Label.Location = new System.Drawing.Point(33, 36);
this.Label.Name = "Label";
this.Label.Size = new System.Drawing.Size(42, 15);
```

```
            this.Label.TabIndex = 4;
            this.Label.Text = "Число\r\n";
            this.Label.Click += new System.EventHandler(this.Label_Click);
            //
            // label1
            //
            this.label1.AutoSize = true;
            this.label1.Location = new System.Drawing.Point(192, 36);
            this.label1.Name = "label1";
            this.label1.Size = new System.Drawing.Size(238, 15);
            this.label1.TabIndex = 5;
            this.label1.Text = "Сумма первой цифры числа и последней";
            //
            // Form1
            //
            this.AutoScaleDimensions = new System.Drawing.SizeF(7F, 15F);
            this.AutoScaleMode = System.Windows.Forms.AutoScaleMode.Font;
            this.ClientSize = new System.Drawing.Size(800, 450);
            this.Controls.Add(this.label1);
            this.Controls.Add(this.Label);
            this.Controls.Add(this.richTextBox1);
            this.Controls.Add(this.button1);
            this.Controls.Add(this.numericUpDown2);
            this.Controls.Add(this.numericUpDown1);
            this.Name = "Form1";
            this.Text = "Form1";
            ((System.ComponentModel.ISupportInitialize)(this.numericUpDown2)).EndInit();
            ((System.ComponentModel.ISupportInitialize)(this.numericUpDown1)).EndInit();
            this.ResumeLayout(false);
            this.PerformLayout();

        }

        #endregion
        private NumericUpDown numericUpDown2;
        private Button button1;
        private NumericUpDown numericUpDown1;
        private RichTextBox richTextBox1;
        private Label Label;
        private Label label1;
    }
}
```

form2.cs

```
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 lab_1_win_forms
{
  public partial class Form2 : Form
  {
    public Form2()
    {
      InitializeComponent();
    }

    private void button1_Click(object sender, EventArgs e)
    {
      for (int i = 100; i <= 999; i++)
      {
        if (i % 5 == 0 && i % 2 == 1 && i % 3 == 2 && i % 4 == 3)
        {
          richTextBox1.Text += i + " ";
        }
      }
    }

  }
}
```

form2.designer.cs

```
namespace lab_1_win_forms
{
  partial class Form2
  {
    /// <summary>
    /// Required designer variable.
    /// </summary>
    private System.ComponentModel.IContainer components = null;
```

```
/// <summary>
/// Clean up any resources being used.
/// </summary>
/// <param name="disposing">true if managed resources should be disposed; otherwise, false.</param>
protected override void Dispose(bool disposing)
{
    if (disposing && (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.button1 = new System.Windows.Forms.Button();
    this.richTextBox1 = new System.Windows.Forms.RichTextBox();
    this.SuspendLayout();
    //
    // button1
    //
    this.button1.Location = new System.Drawing.Point(128, 110);
    this.button1.Name = "button1";
    this.button1.Size = new System.Drawing.Size(75, 23);
    this.button1.TabIndex = 0;
    this.button1.Text = "button1";
    this.button1.UseVisualStyleBackColor = true;
    this.button1.Click += new System.EventHandler(this.button1_Click);
    //
    // richTextBox1
    //
    this.richTextBox1.Location = new System.Drawing.Point(426, 39);
    this.richTextBox1.Name = "richTextBox1";
    this.richTextBox1.Size = new System.Drawing.Size(264, 195);
    this.richTextBox1.TabIndex = 1;
```

```
            this.richTextBox1.Text = "";
            // this.richTextBox1.TextChanged += new System.EventHandler(this.richTextBox1_TextChanged);
            //
            // Form2
            //
            this.AutoScaleDimensions = new System.Drawing.SizeF(7F, 15F);
            this.AutoScaleMode = System.Windows.Forms.AutoScaleMode.Font;
            this.ClientSize = new System.Drawing.Size(800, 450);
            this.Controls.Add(this.richTextBox1);
            this.Controls.Add(this.button1);
            this.Name = "Form2";
            this.Text = "Form2";
            this.ResumeLayout(false);

        }

        #endregion

        private Button button1;
        private RichTextBox richTextBox1;
    }
}
```

form3.designer.cs

```
namespace lab_1_win_forms
{
    partial class Form3
    {
        /// <summary>
        /// Required designer variable.
        /// </summary>
        private System.ComponentModel.IContainer components = null;

        /// <summary>
        /// Clean up any resources being used.
        /// </summary>
        /// <param name="disposing">true if managed resources should be disposed; otherwise, false.</param>
        protected override void Dispose(bool disposing)
        {
            if (disposing && (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.textBox1 = new System.Windows.Forms.TextBox();
    this.textBox2 = new System.Windows.Forms.TextBox();
    this.richTextBox1 = new System.Windows.Forms.RichTextBox();
    this.button1 = new System.Windows.Forms.Button();
    this.richTextBox2 = new System.Windows.Forms.RichTextBox();
    this.label1 = new System.Windows.Forms.Label();
    this.SuspendLayout();
    //
    // textBox1
    //
    this.textBox1.Location = new System.Drawing.Point(135, 55);
    this.textBox1.Name = "textBox1";
    this.textBox1.Size = new System.Drawing.Size(219, 23);
    this.textBox1.TabIndex = 0;
    //
    // textBox2
    //
    this.textBox2.Location = new System.Drawing.Point(135, 97);
    this.textBox2.Name = "textBox2";
    this.textBox2.Size = new System.Drawing.Size(219, 23);
    this.textBox2.TabIndex = 1;
    //
    // richTextBox1
    //
    this.richTextBox1.Location = new System.Drawing.Point(431, 12);
    this.richTextBox1.Name = "richTextBox1";
    this.richTextBox1.Size = new System.Drawing.Size(357, 426);
    this.richTextBox1.TabIndex = 2;
    this.richTextBox1.Text = "";
    //
    // button1
```

```
//
this.button1.Location = new System.Drawing.Point(203, 143);
this.button1.Name = "button1";
this.button1.Size = new System.Drawing.Size(75, 23);
this.button1.TabIndex = 3;
this.button1.Text = "button1";
this.button1.UseVisualStyleBackColor = true;
this.button1.Click += new System.EventHandler(this.button1_Click);
//
// richTextBox2
//
this.richTextBox2.Location = new System.Drawing.Point(135, 199);
this.richTextBox2.Name = "richTextBox2";
this.richTextBox2.Size = new System.Drawing.Size(219, 63);
this.richTextBox2.TabIndex = 4;
this.richTextBox2.Text = "";
//this.richTextBox2.TextChanged += new System.EventHandler(this.richTextBox2_TextChanged);
//
// label1
//
this.label1.AutoSize = true;
this.label1.FlatStyle = System.Windows.Forms.FlatStyle.Flat;
this.label1.Location = new System.Drawing.Point(203, 181);
this.label1.Name = "label1";
this.label1.Size = new System.Drawing.Size(50, 15);
this.label1.TabIndex = 5;
this.label1.Text = "unicode";
//
// Form3
//
this.AutoScaleDimensions = new System.Drawing.SizeF(7F, 15F);
this.AutoScaleMode = System.Windows.Forms.AutoScaleMode.Font;
this.ClientSize = new System.Drawing.Size(800, 450);
this.Controls.Add(this.label1);
this.Controls.Add(this.richTextBox2);
this.Controls.Add(this.button1);
this.Controls.Add(this.richTextBox1);
this.Controls.Add(this.textBox2);
this.Controls.Add(this.textBox1);
this.Name = "Form3";
this.Text = "Form3";
this.ResumeLayout(false);
```

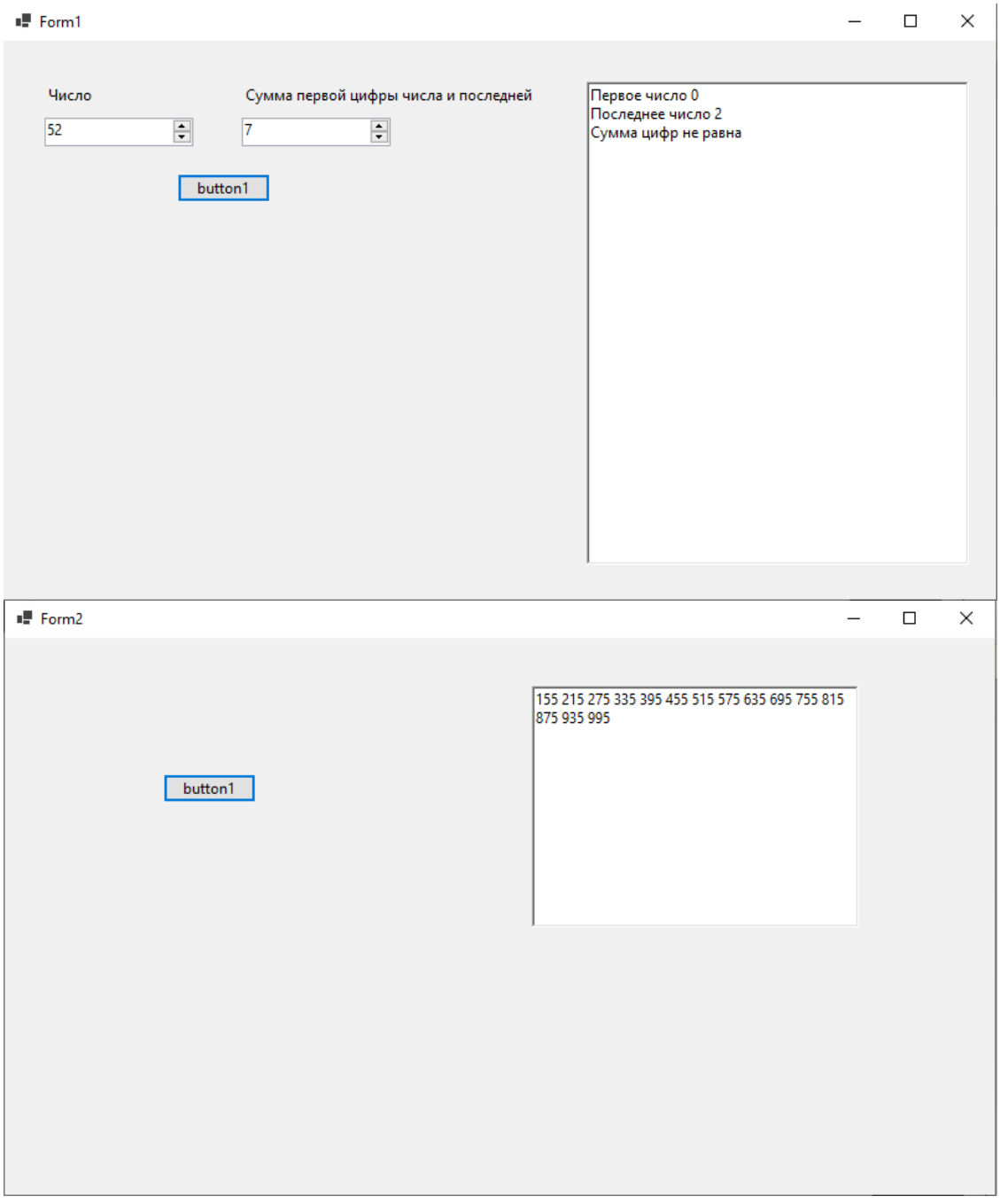
```
        this.PerformLayout();

    }

    #endregion

    private TextBox textBox1;
    private TextBox textBox2;
    private RichTextBox richTextBox1;
    private Button button1;
    private RichTextBox richTextBox2;
    private Label label1;
  }
}
```

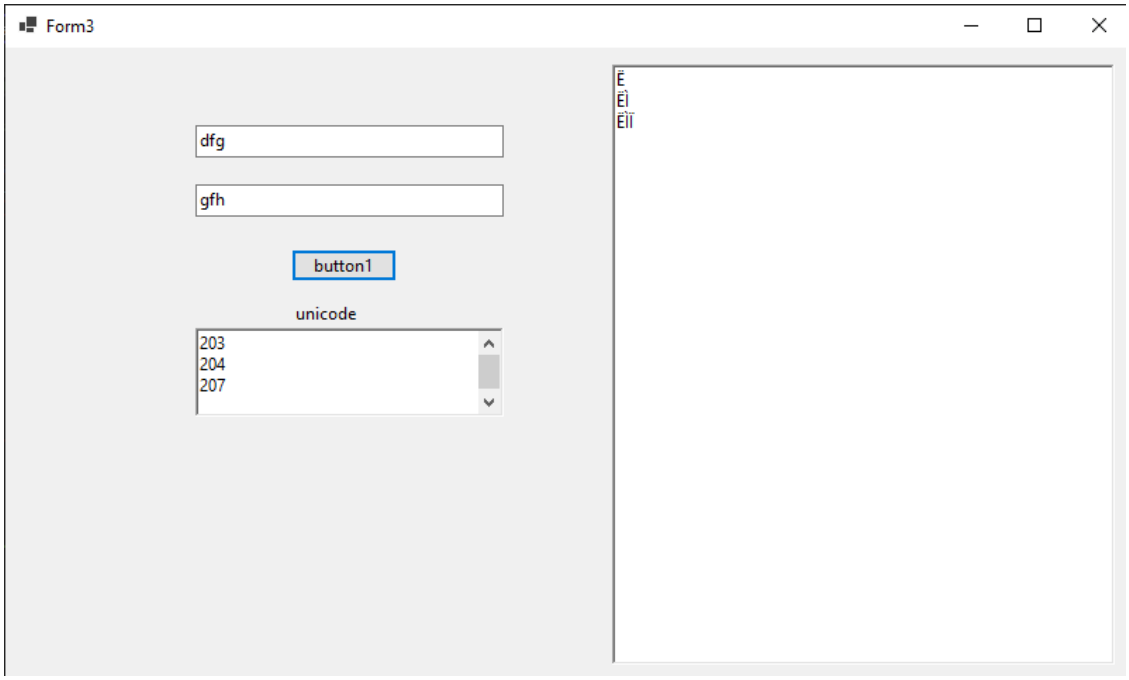
form3.cs

```
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 lab_1_win_forms
{
  public partial class Form3 : Form
  {
    public Form3()
    {
      InitializeComponent();
    }

    private void button1_Click(object sender, EventArgs e)
    {

      richTextBox1.Text = "";
      string s1;
      string s2;
      string s = "";
```

```
        if (textBox1.Text == "" || textBox2.Text == "" || textBox1.Text[0] == ' ' || textBox2.Text[0] == ' ')
        {
            MessageBox.Show("Try again");
            return;
        }
        else if (textBox1.Text.Length <= textBox2.Text.Length)
        {
            s1 = textBox1.Text;
            s2 = textBox2.Text;
        }
        else
        {
            s2 = textBox1.Text;
            s1 = textBox2.Text;
        }

        int i = 0;
        int ascii = 0;

        for (; i < s1.Length; i++)
        {
            s += (char)(s1[i] + s2[i]);
            richTextBox1.Text += s + '\n';
            ascii = s1[i] + s2[i];
            richTextBox2.Text += ascii.ToString() + '\n';
        }

        for (; i < s2.Length; i++)
        {
            s += s2[i];
            ascii = s2[i];
            richTextBox2.Text += ascii.ToString() + '\n';
        }
        //richTextBox1.Text += '\n' + s + '\n';
    }

  }
}
```

Windows Forms:

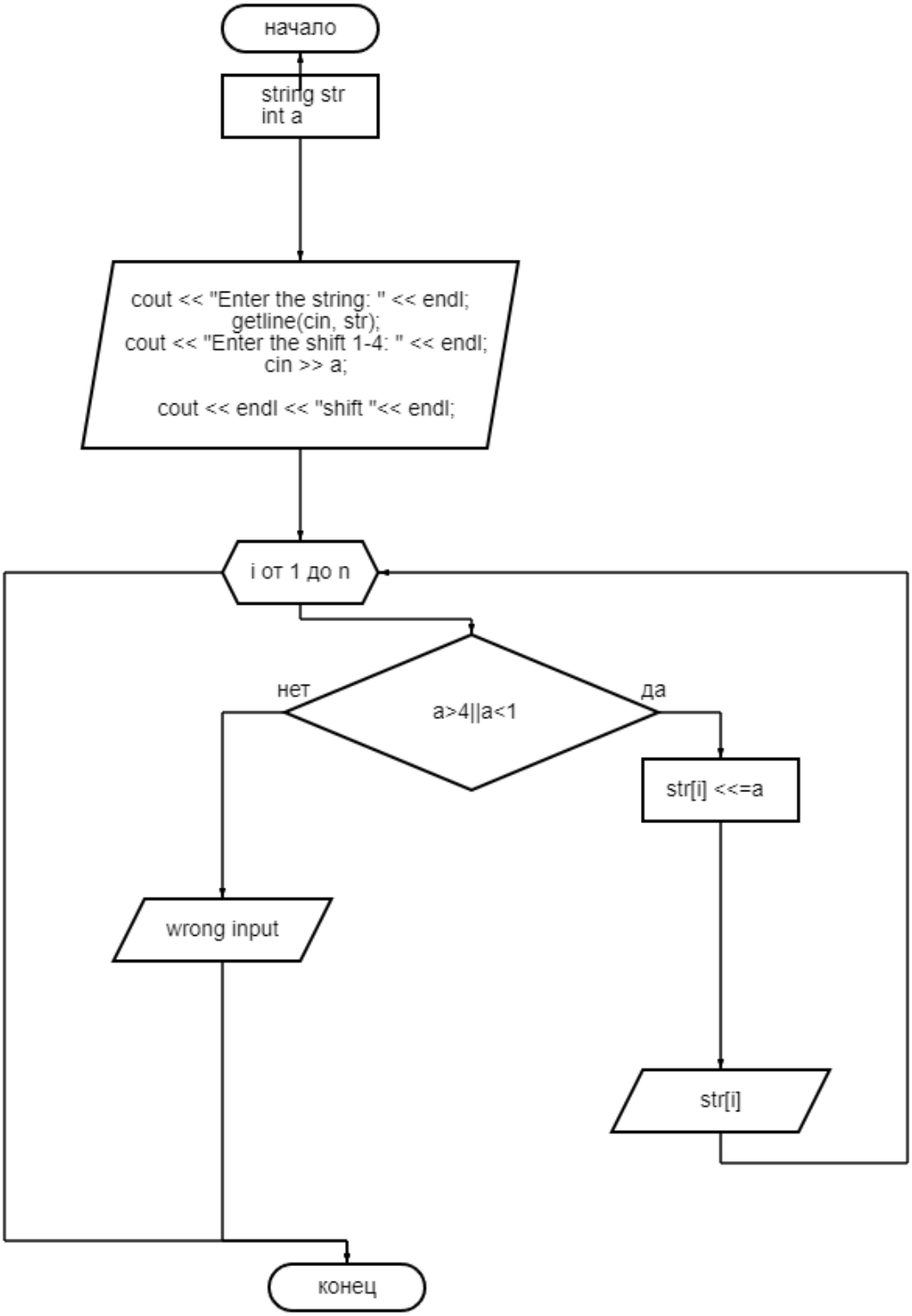




Часть 2 выполняется на языке cpp

Вариант №5. Реализовать к переменным символьного типов побитовые операции сдвига влево на 1, 2, 3 и 4 разряда.

Алгоритм решения



Листинг Windows forms программы + тест:

main.cpp

```
> f main
1  #include <iostream>
2  #include <string>
3  using namespace std;
4  char shift(char c, int n) {
5      return c << n;
6  }
7  int main() {
8    string str;
9    int a;
10   cout << "Enter the string: " << endl;
11   getline(cin, str);
12   cout << "Enter the shift 1-4: " <<
   endl;
13   cin >> a;
14
15   cout << endl << "shift "<< endl;
16   for (int i = 0; i < str.length(); i++)

17   {
18     if(a>4||a<1)
19     {
20     cout<<"wrong input";
21       break;
22     }
23   //str[i] = shift(str[i], a);
24   str[i] <<= a;
25     cout << str[i];
26   }
27   cout << endl;
28   return 0;
29 }
```

Console Shell

```
> sh -c make -s
> ./main
Enter the string:
dgh
Enter the shift 1-4:
3

shift
 8@
>
```

Вывод:

Получили навыки работы с основными инструментами среды программирования Microsoft Visual Studio 2022. Создали программу с использованием Windows Forms на языках C#, C++, C.