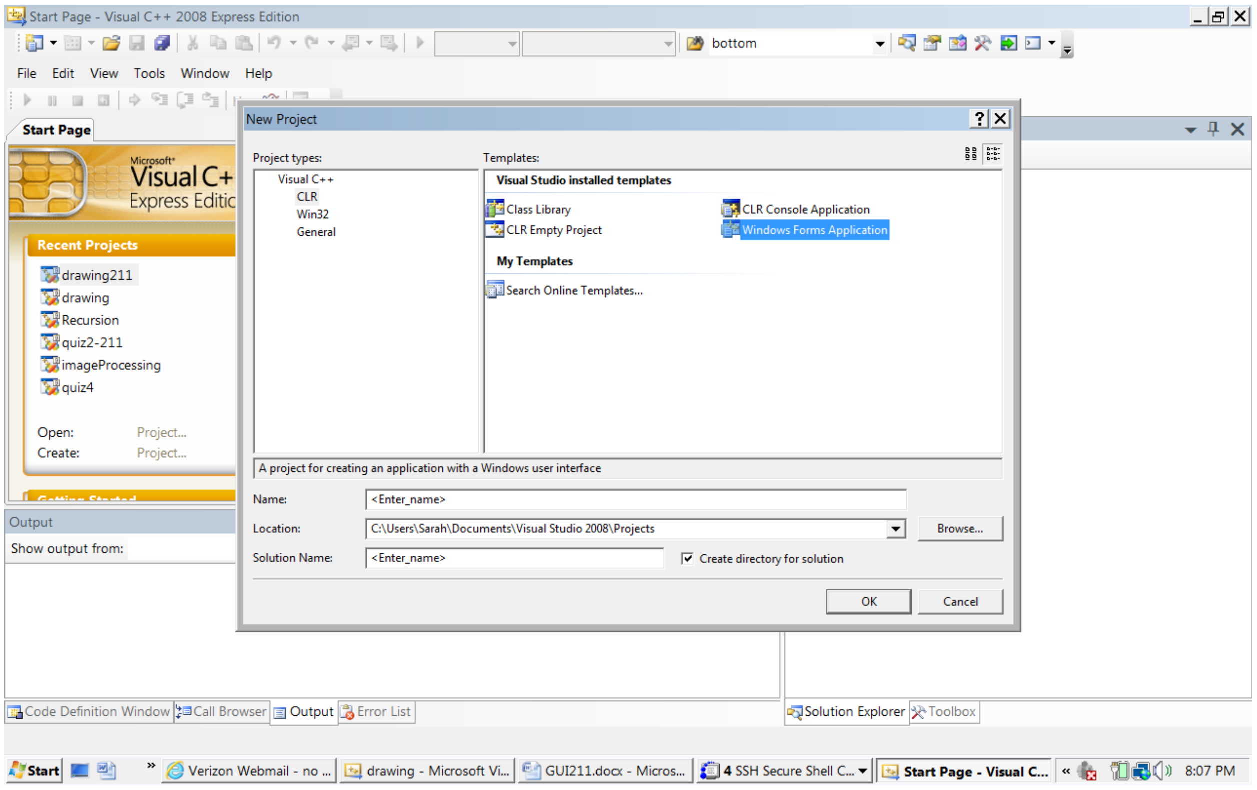
Graphic User Interface (Practice Using Objects)

1. Open a new Project: CLR/Windows Form Application



Start Page - Visual C++ 2008 Express Edition

New Project

Project types:
- Visual C++
  - CLR
  - Win32
  - General

Templates:

Visual Studio installed templates
- Class Library
- CLR Console Application
- CLR Empty Project
- Windows Forms Application

My Templates
- Search Online Templates...

A project for creating an application with a Windows user interface

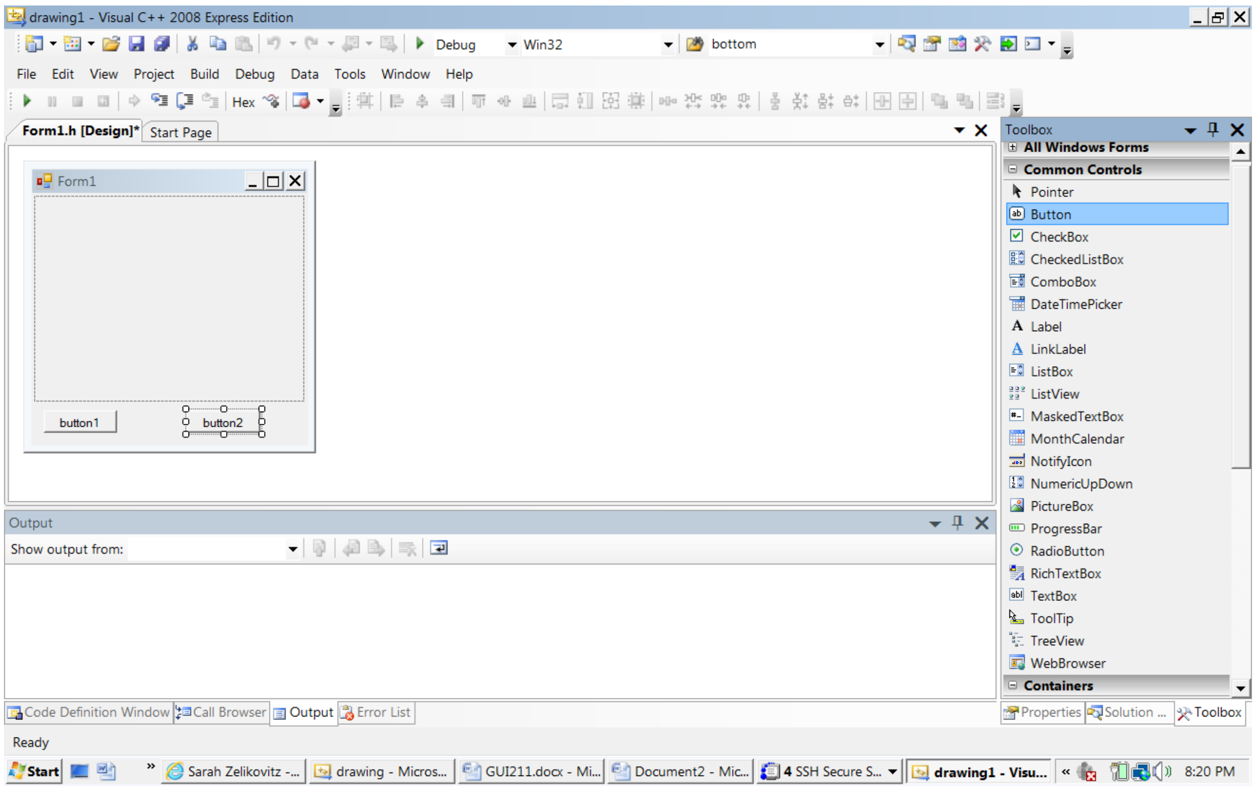
Name: <Enter_name>

Location: C:\Users\Sarah\Documents\Visual Studio 2008\Projects

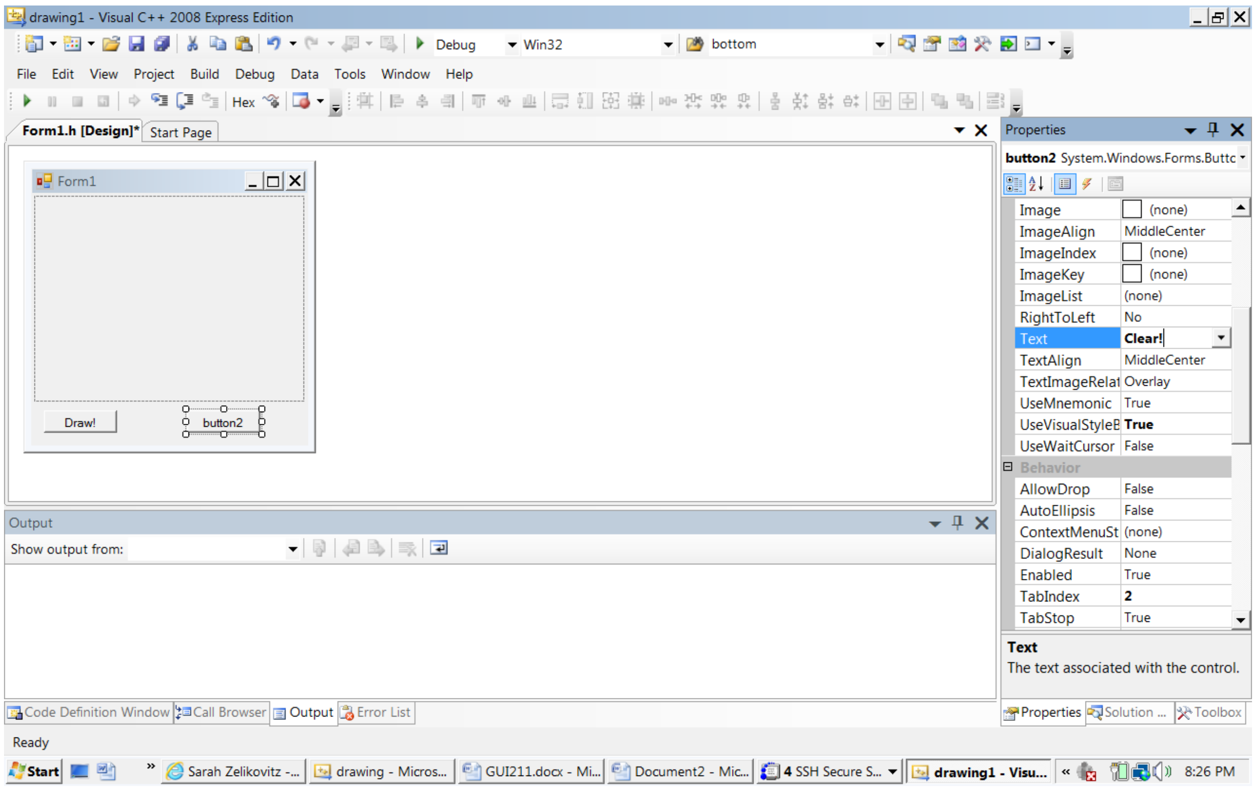
Solution Name: <Enter_name>

[✓] Create directory for solution

2. We will be using `Drawing` objects. The form should contain one *pictureBox* and two *buttons*. We will use one button to draw objects, and the other button to clear the *pictureBox*. Open the Toolbox (using View/ToolBox from the bar menu), if it is not open already. Drag a pictureBox and two buttons onto your form.



3. Select each button and look at the properties of that button. If you don't see the Properties window, right click on the button to open it. Change the Text property of the first button to **Draw!** and the second button to **Clear!**



Properties

button2 System.Windows.Forms.Button

Image	(none)
ImageAlign	MiddleCenter
ImageIndex	(none)
ImageKey	(none)
ImageList	(none)
RightToLeft	No
Text	**Clear!**
TextAlign	MiddleCenter
TextImageRelat	Overlay
UseMnemonic	True
UseVisualStyleB	**True**
UseWaitCursor	False
Behavior	
AllowDrop	False
AutoEllipsis	False
ContextMenuSt	(none)
DialogResult	None
Enabled	True
TabIndex	**2**
TabStop	True

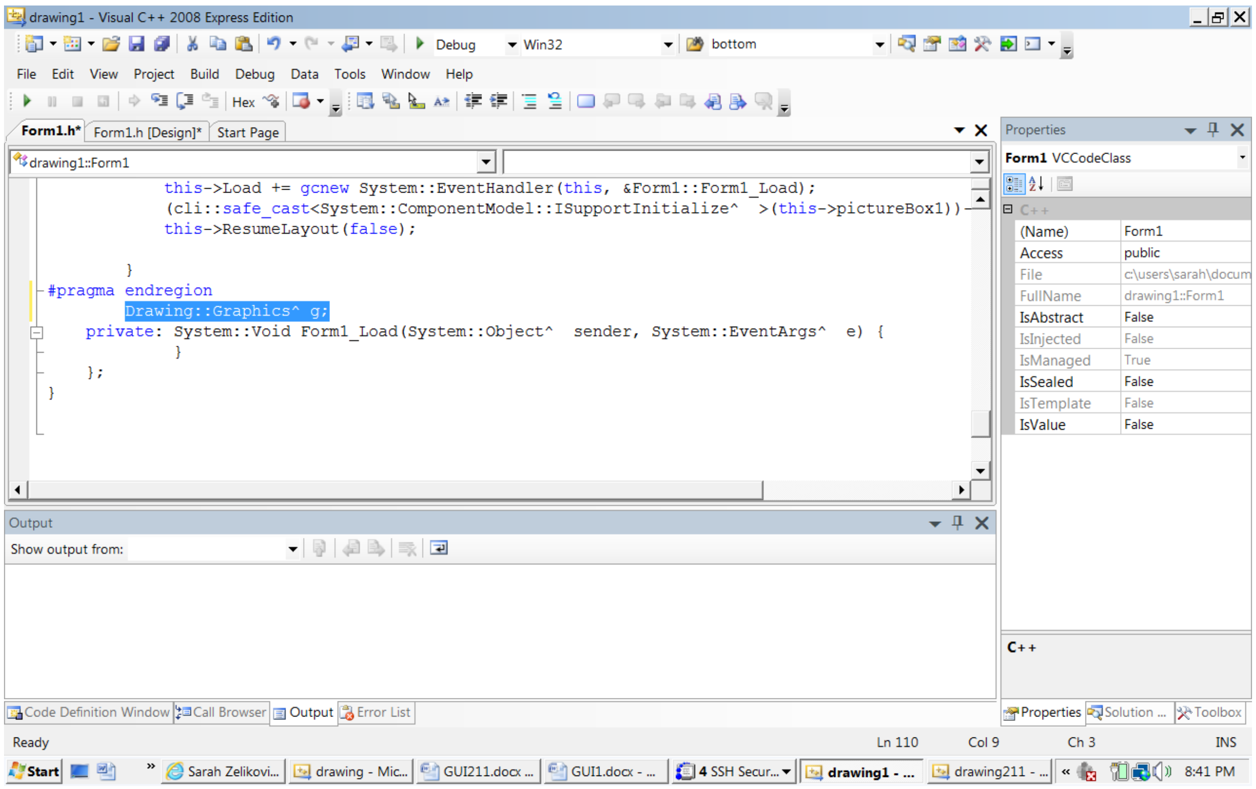
Text
The text associated with the control.

4. Double click next to one of the buttons on the form. This should bring you to the form1.h file, with an empty function named `Form1_Load`. Immediately above the function, and right after the line `#pragma endregion`, place the following line of code:

```
Drawing::Graphics^ g;
```

`g` is a Graphics object that is in the `Drawing` class
(notice the scope resolution operator **::**)

The **^** is called a *"handle"* and it is used in C++/CLR. It is similar to the * (pointer declaration) that we covered in class. The difference between them is beyond the scope of this project, except to say that the programmer must allocate objects declared with **^** using `gcnew`, but they are garbage collected automatically.



```
                this->Load += gcnew System::EventHandler(this, &Form1::Form1_Load);
                (cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this->pictureBox1))
                this->ResumeLayout(false);

            }
#pragma endregion
                Drawing::Graphics^ g;
        private: System::Void Form1_Load(System::Object^  sender, System::EventArgs^  e) {
                 }
        };
}
```

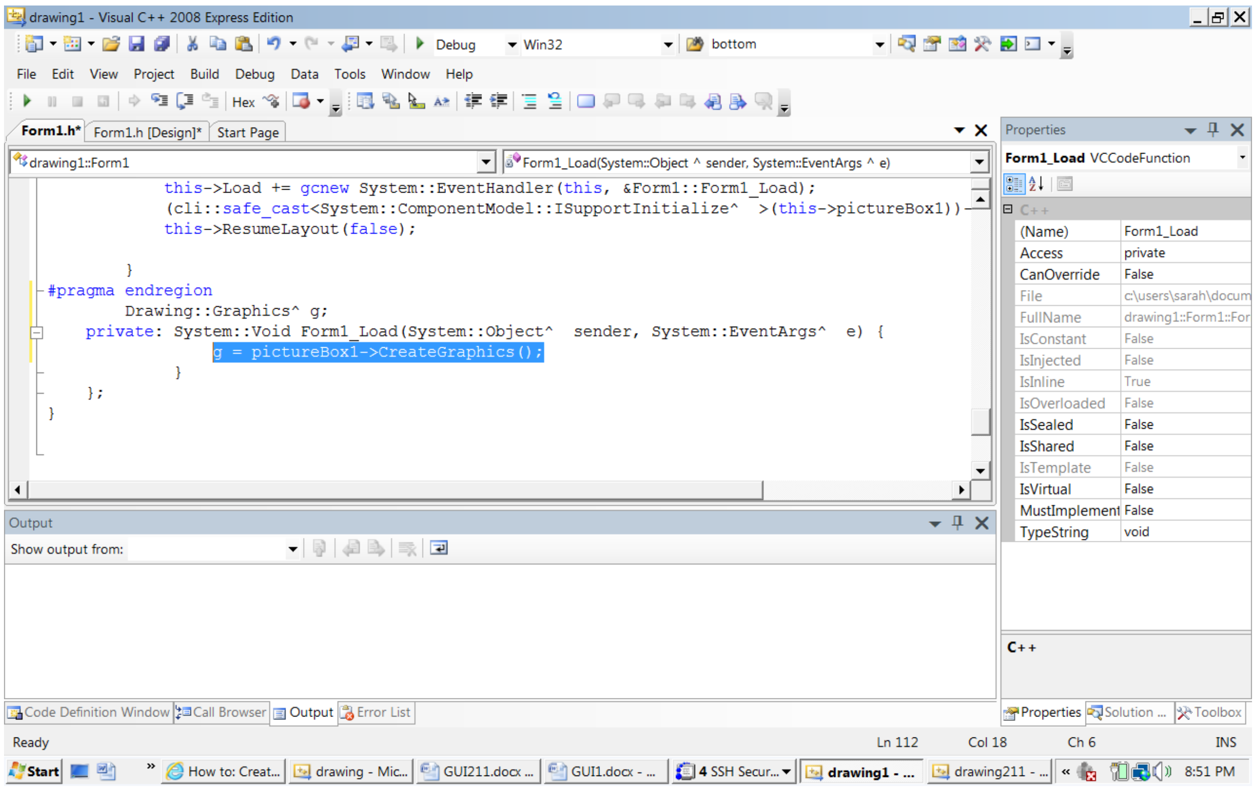
Properties

Form1 VCCodeClass

C++

(Name)	Form1
Access	public
File	c:\users\sarah\docum
FullName	drawing1::Form1
IsAbstract	False
IsInjected	False
IsManaged	True
IsSealed	False
IsTemplate	False
IsValue	False

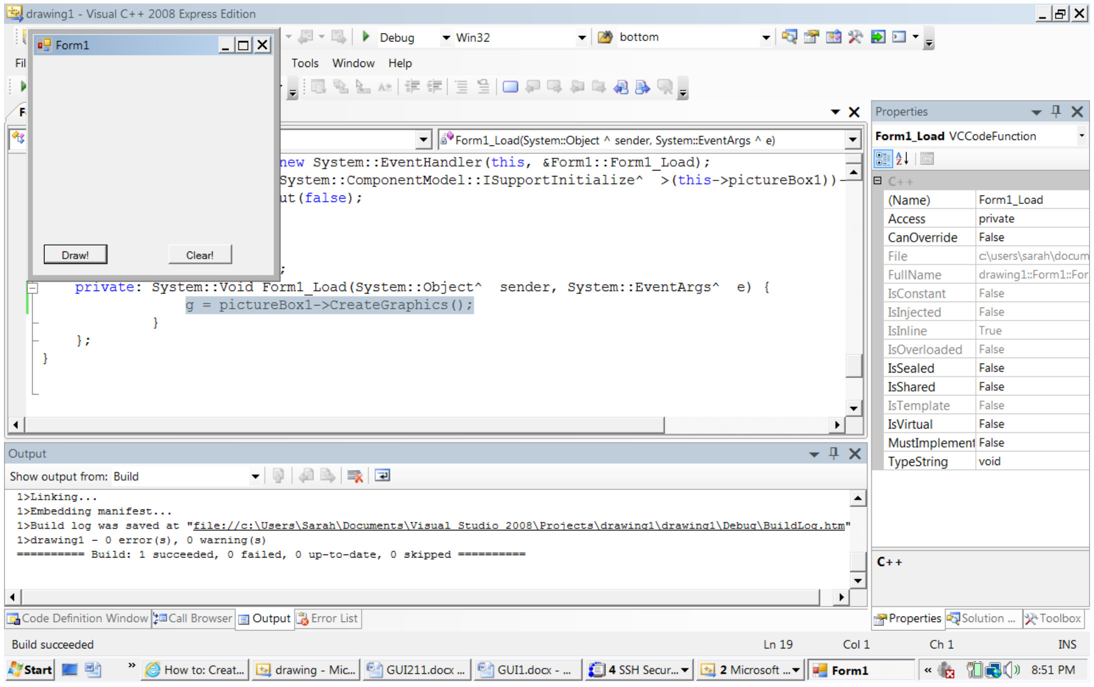
4. For the body of the function `Form1_Load,` place the following line of code.
   `g = pictureBox1->CreateGraphics();`
   This line of code creates an instance of the `Graphics` object. The `Graphics` object represents a drawing surface, and is the object that is used to create graphical images (http://msdn.microsoft.com/en-us/library/5y289054.aspx)



```
                this->Load += gcnew System::EventHandler(this, &Form1::Form1_Load);
                (cli::safe_cast<System::ComponentModel::ISupportInitialize^  >(this->pictureBox1))
                this->ResumeLayout(false);

            }
#pragma endregion
            Drawing::Graphics^ g;
        private: System::Void Form1_Load(System::Object^  sender, System::EventArgs^  e) {
                     g = pictureBox1->CreateGraphics();
                 }
        };
}
```

(Name)	Form1_Load
Access	private
CanOverride	False
File	c:\users\sarah\docum
FullName	drawing1::Form1::For
IsConstant	False
IsInjected	False
IsInline	True
IsOverloaded	False
IsSealed	False
IsShared	False
IsTemplate	False
IsVirtual	False
MustImplement	False
TypeString	void

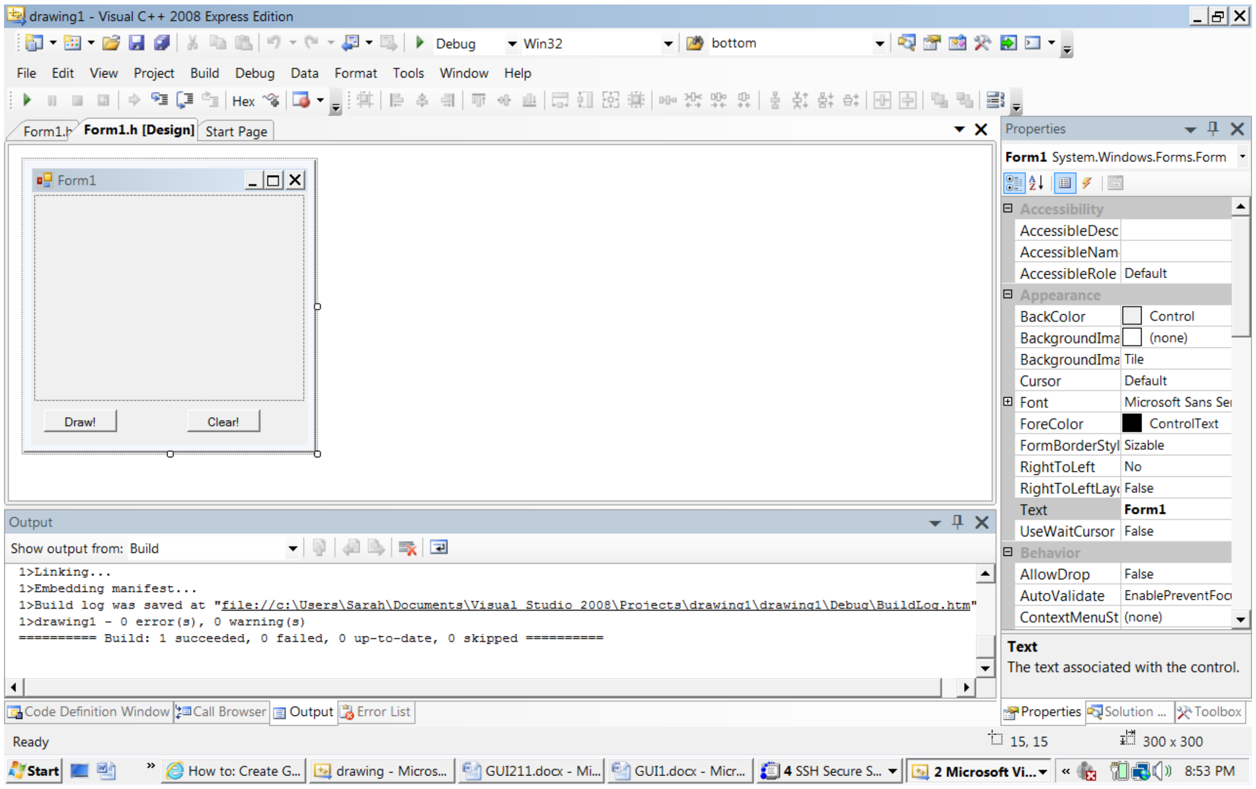
5. You can compile and run your code, if you wish. Press CTL-F5



```
        private: System::Void Form1_Load(System::Object^  sender, System::EventArgs^  e) {
                     g = pictureBox1->CreateGraphics();
                 }
        };
}
```

```
1>Linking...
1>Embedding manifest...
1>Build log was saved at "file://c:\Users\Sarah\Documents\Visual Studio 2008\Projects\drawing1\drawing1\Debug\BuildLog.htm"
1>drawing1 - 0 error(s), 0 warning(s)
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```

6. You can click on the Form1.h (design) tab to get back to the design window.



Output

Show output from: Build

```
1>Linking...
1>Embedding manifest...
1>Build log was saved at "file://c:\Users\Sarah\Documents\Visual Studio 2008\Projects\drawing1\drawing1\Debug\BuildLog.htm"
1>drawing1 - 0 error(s), 0 warning(s)
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```

Properties

Form1 System.Windows.Forms.Form

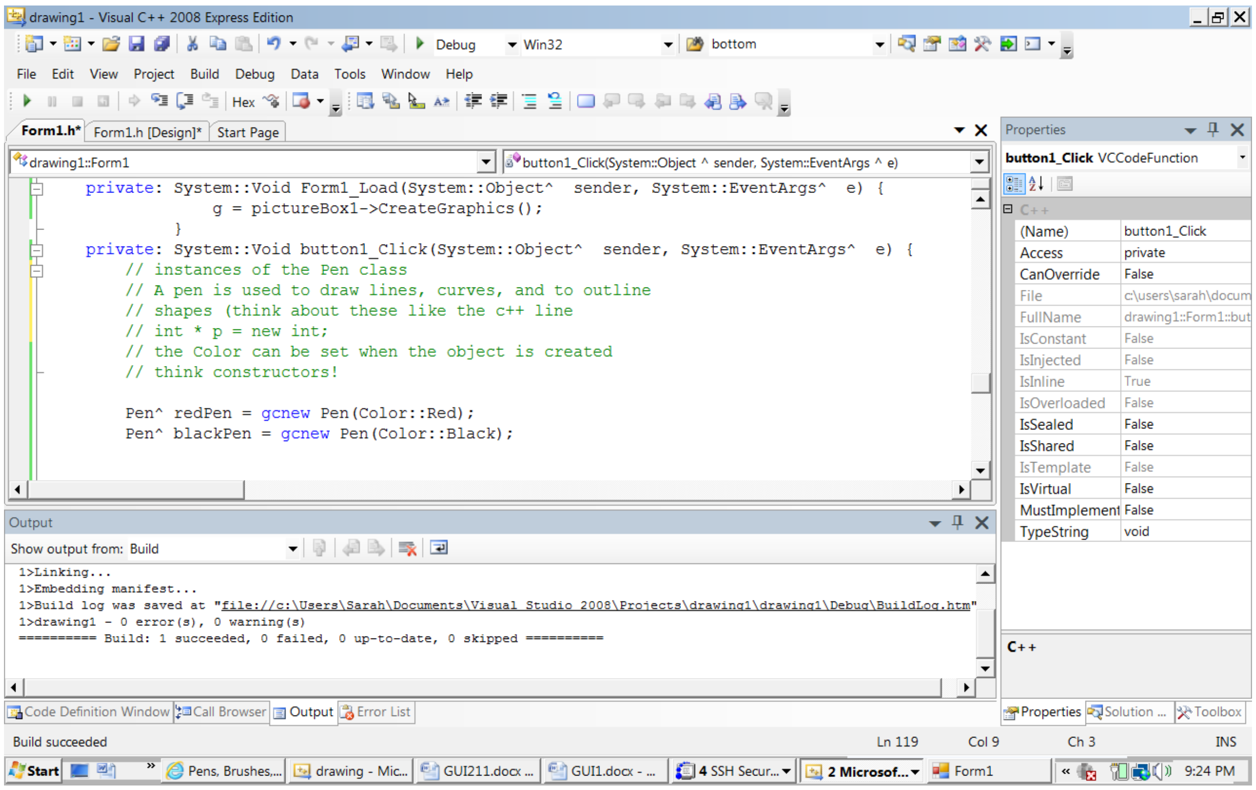
Accessibility	
AccessibleDesc	
AccessibleNam	
AccessibleRole	Default
Appearance	
BackColor	⬜ Control
BackgroundIma	⬜ (none)
BackgroundIma	Tile
Cursor	Default
Font	Microsoft Sans Se
ForeColor	⬛ ControlText
FormBorderStyl	Sizable
RightToLeft	No
RightToLeftLay	False
Text	**Form1**
UseWaitCursor	False
Behavior	
AllowDrop	False
AutoValidate	EnablePreventFoc
ContextMenuSt	(none)

Text
The text associated with the control.

7. Double click on the Draw! button to get to the event handler `button1_Click` (this is a function or method that is called each time the button is clicked) called. Between the curly braces of this function (i.e., in the body of the function), type the following. These are just examples, you can use other drawing objects.

```
// instances of the Pen class
// A pen is used to draw lines, curves, and to outline
// shapes (think about these like the c++ line
// int * p = new int;
// the Color can be set when the object is created
// think constructors!

Pen^ redPen = gcnew Pen(Color::Red);
Pen^ blackPen = gcnew Pen(Color::Black);


// instance of Brush class

Brush^ greenBrush = gcnew Drawing::SolidBrush(Color::Green);

//declare a rectangle called circleRect.  The first two
//parameters correspond to the  x and y position on the
//form of the top left corner of the rectangle, and the
```

```
//next two parameters are the  width and height of the
//rectangle. You can think of the top left corner of the
//form as positon (0,0), and x increases to the right and y
//increases downward
Rectangle circleRect(45,30,100,100);

//call the function FillEllipse using the graphics object
//g.  The two parameters are the brush and the rectangle.
//This function fills a circle.  Try other function such as
//FillRectangle or FillPolygon

g->FillEllipse(greenBrush,circleRect);

//set Width of the Pen
redPen->Width = 5.0F;
blackPen->Width = 3.0F;

//declare Point objects, parameters are x,y coordinates
Point startPoint = Point(120, 30);
Point endPoint = Point(120, 80);

//call DrawLine method (function) sending three parameters:
//a Pen, and two points.  This draws a line on the graphics
//object, with the pen from the first point to the second
//point
g->DrawLine( redPen, startPoint, endPoint);
g->DrawLine( redPen, startPoint, endPoint);

//call other methods.  DrawArc and DrawPie take a Pen, a
//Rectangle and a start point and number of degrees
g->DrawArc(redPen, circleRect, 25.0, 180.0);
g->DrawPie(blackPen, circleRect, 180.0, 25.0);
```



```
    private: System::Void Form1_Load(System::Object^  sender, System::EventArgs^  e) {
                 g = pictureBox1->CreateGraphics();
             }
    private: System::Void button1_Click(System::Object^  sender, System::EventArgs^  e) {
        // instances of the Pen class
        // A pen is used to draw lines, curves, and to outline
        // shapes (think about these like the c++ line
        // int * p = new int;
        // the Color can be set when the object is created
        // think constructors!

        Pen^ redPen = gcnew Pen(Color::Red);
        Pen^ blackPen = gcnew Pen(Color::Black);
```

Show output from: Build

```
1>Linking...
1>Embedding manifest...
1>Build log was saved at "file://c:\Users\Sarah\Documents\Visual Studio 2008\Projects\drawing1\drawing1\Debug\BuildLog.htm"
1>drawing1 - 0 error(s), 0 warning(s)
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```

button1_Click VCCodeFunction

(Name)	button1_Click
Access	private
CanOverride	False
File	c:\users\sarah\docum
FullName	drawing1::Form1::but
IsConstant	False
IsInjected	False
IsInline	True
IsOverloaded	False
IsSealed	False
IsShared	False
IsTemplate	False
IsVirtual	False
MustImplement	False
TypeString	void

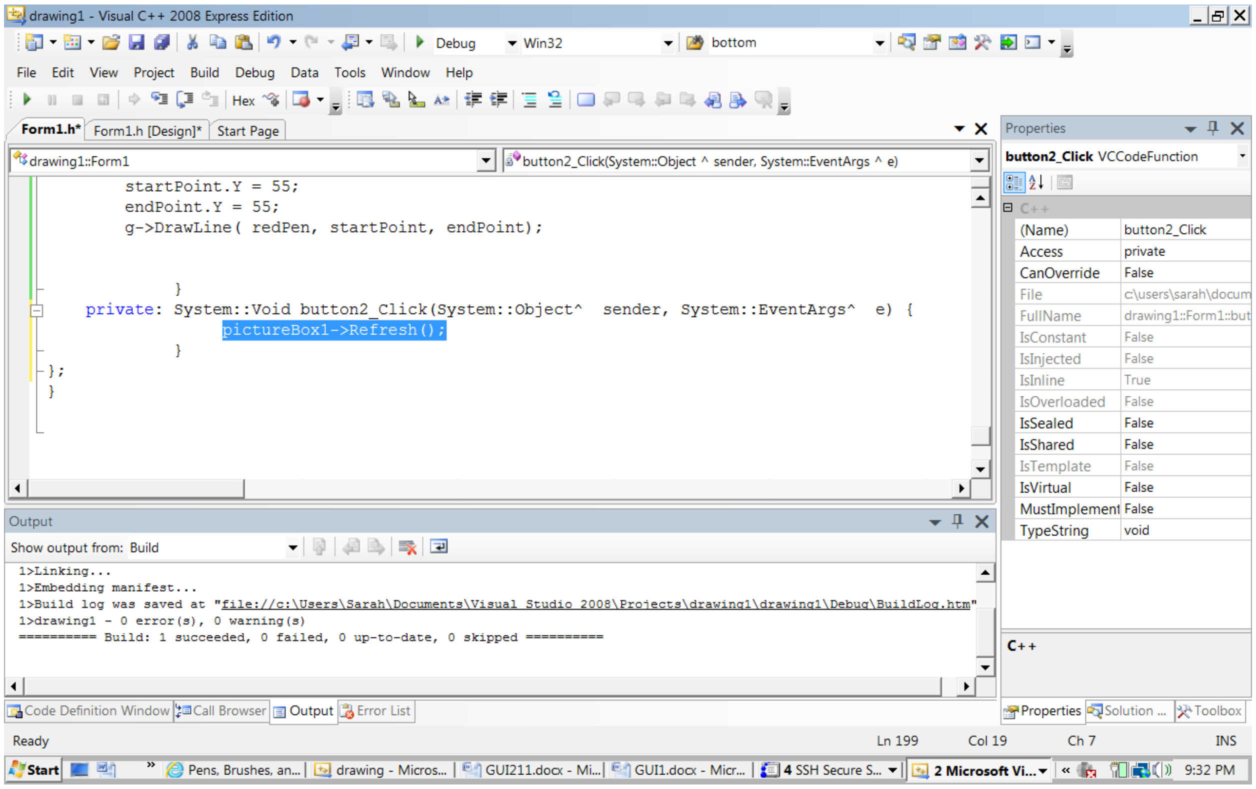
Build succeeded   Ln 119   Col 9   Ch 3   INS

8. Compile and run your program. Click the Draw button. The shapes and lines are drawn. Probably you can use the methods and objects to draw something a bit nicer. Try this code in the draw function:

```
Pen^ redPen = gcnew Pen(Color::Red);

redPen->Width = 5.0F;

Point startPoint = Point(120, 30);
Point endPoint = Point(120, 80);
g->DrawLine( redPen, startPoint, endPoint);


startPoint.X = 150; //changes X coordinate
endPoint.X = 150;
g->DrawLine( redPen, startPoint, endPoint);
startPoint.X = 170;
endPoint.X = 170;
g->DrawLine( redPen, startPoint, endPoint);
startPoint.X = 190;
endPoint.X = 190;
g->DrawLine( redPen, startPoint, endPoint);
startPoint.X = 190;
endPoint.X = 190;
startPoint.Y = 85;
endPoint.Y = 90;
g->DrawLine( redPen, startPoint, endPoint);
```

```
startPoint.X = 120;
endPoint.X = 150;
startPoint.Y = 55;
endPoint.Y = 55;
g->DrawLine( redPen, startPoint, endPoint);
```

9. Double Click on the clear button and add one line to the body of the event handler as seen below in the screen shot.



```
        startPoint.Y = 55;
        endPoint.Y = 55;
        g->DrawLine( redPen, startPoint, endPoint);


             }
    private: System::Void button2_Click(System::Object^  sender, System::EventArgs^  e) {
                 pictureBox1->Refresh();
             }
};
}
```

```
1>Linking...
1>Embedding manifest...
1>Build log was saved at "file://c:\Users\Sarah\Documents\Visual Studio 2008\Projects\drawing1\drawing1\Debug\BuildLog.htm"
1>drawing1 - 0 error(s), 0 warning(s)
========== Build: 1 succeeded, 0 failed, 0 up-to-date, 0 skipped ==========
```

(Name)	button2_Click
Access	private
CanOverride	False
File	c:\users\sarah\docum
FullName	drawing1::Form1::but
IsConstant	False
IsInjected	False
IsInline	True
IsOverloaded	False
IsSealed	False
IsShared	False
IsTemplate	False
IsVirtual	False
MustImplement	False
TypeString	void

References

1. James Allert, Programming with Visual C++ ISBN978-1-4239-0186-0

2. http://www.youtube.com/watch?v=klty_vu20qY