Introduction

Microsoft Visual Basic 2010 programming

Objectives

* Understand software and computer programs
* State the role of a developer in creating computer programs
* Specify the use of a graphical user interface and describe an event-driven program
* Specify the roles of input, processing, output, and data when running a program on a computer
* Describe the arithmetic operations a computer program can perform (+, -, *, /, and ^)

Objectives

* Define and describe the use of a database
* Identify the use of a computer programming language in general, and Visual Basic 2010 in particular
* Explain the use of Visual Studio 2010 IDE when developing Visual Basic 2010 programs
* Specify the programming languages available for use with Visual Studio 2010 (Visual Basic, C++, C#, F#)
* Specify the types of Visual Basic 2010 applications

Introduction

* The set of instructions that directs a computer to perform tasks is called **computer software**, or a **computer program**

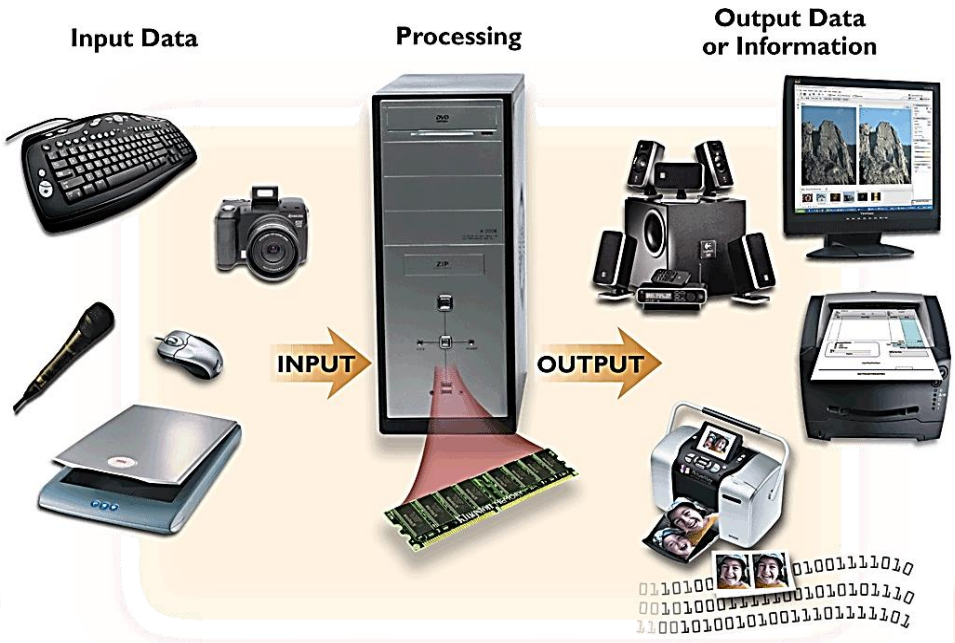
```
24      Private Sub btnSelectRoom_Click(ByVal sender As System.Object, ByVal e As System.Ev
25          ' This code is executed when the user
26          ' clicks the Select Room button. It
27          ' disables the Standard Room button,
28          ' the Select Room button, and the
29          ' Deluxe Room button. It hides the
30          ' Instructions label, displays the
31          ' Confirmation Message label, and
32          ' enables the Exit Window button.
33
34          btnStandardRoom.Enabled = False
35          btnSelectRoom.Enabled = False
36          btnDeluxeRoom.Enabled = False
37          lblInstructions.Visible = False
38          lblConfirmationMessage.Visible = True
39          btnExitWindow.Enabled = True
40
41      End Sub
42
43      Private Sub btnDeluxeRoom_Click(ByVal sender As System.Object, ByVal e As System.Eve
44          ' This code is executed when the user
45          ' clicks the Deluxe Room button. It
46          ' displays the Deluxe Room picture,
47          ' hides the Standard Room picture, and
48          ' enables the Select Room button.
49
50          picDeluxeRoom.Visible = True
51          picStandardRoom.Visible = False
52          btnSelectRoom.Enabled = True
53
54      End Sub
```

Introduction

* **Computer hardware** is the physical equipment associated with a computer

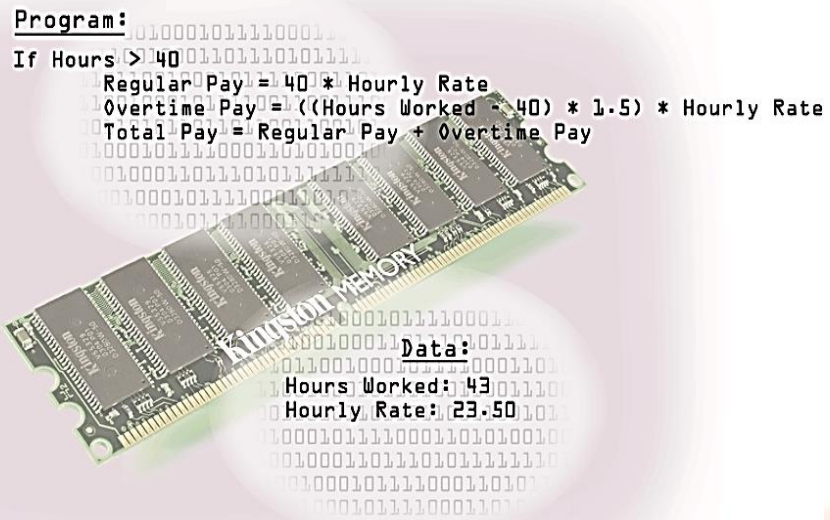
Introduction

* The basic function of many computer programs is to accept some form of data (sometimes called **input data**) manipulate the data in some manner (sometimes called **processing**), and create some form of **output** data usable by people or other computers, and **storage**



Introduction

* In order for the computer to execute a program:
  * Program and data must be placed in the computer's **random access memory (RAM)**
  * The **central processing unit (CPU)** can access the instructions in the program and the data in RAM to perform activities as directed by the program



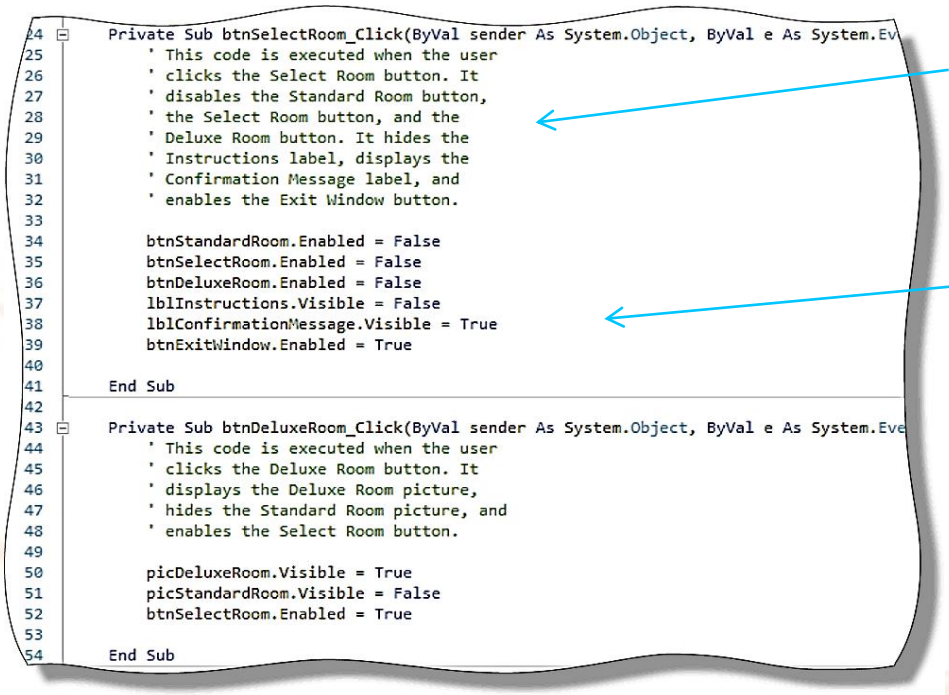
Introduction

* **Saving**, or **storing**, data refers to placing the data or software electronically on a storage medium in a persistent form.
  * Hard disk
  * Universal Serial Bus (USB) drive
* **Persistent** data remains available even after the computer power is turned off

Computer Programmers and Developers

* A computer program is designed and developed by people known as **computer programmers**, or developers
* **Developers** are people skilled in designing computer programs and creating them using programming languages
* **Applications** may consist of several computer programs working together to solve a problem
* Computer programmers write the code for programs using a **programming language**

Computer Programmers and Developers



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Comments

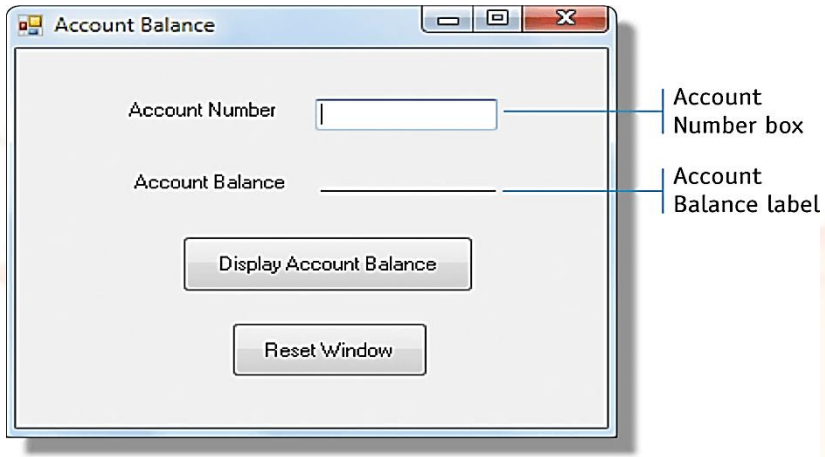
Event-Handler Code

Event-Driven Computer Programs with a Graphical User Interface

* Most Visual Basic 2010 programs are **event-driven programs** that communicate with the user through a **graphical user interface (GUI)**
* A GUI usually consists of a window, containing a variety of objects (icons, buttons, images)
* An **event** means the user has initiated an action (a mouse click or entering text) that causes the program to perform the type of processing called for by the user's action.
  * Clicking a button triggers an event, resulting in the program performing the process called by the click.

Event-Driven Computer Programs with a Graphical User Interface

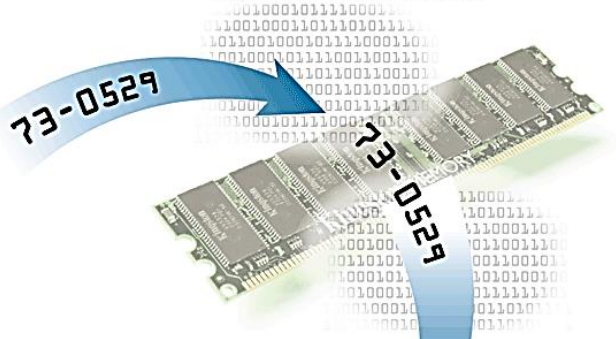
* Examples of events:
  * The user **enters** the account number in the Account Number box
  * The user **clicks** the Display Account Balance button
  * The user **clicks** the Reset Window button to clear the text boxes and prepare the user interface for the next account number



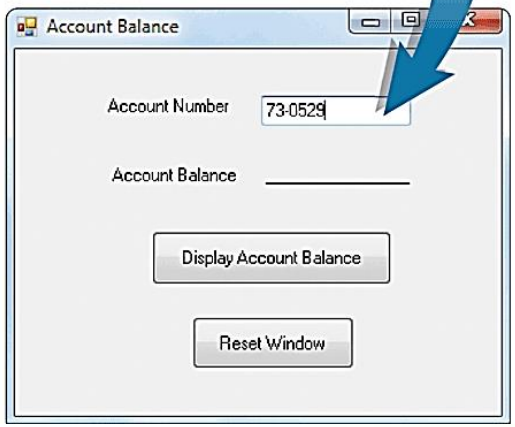
Input Operation

Step 1:
User types the account number on the keyboard.

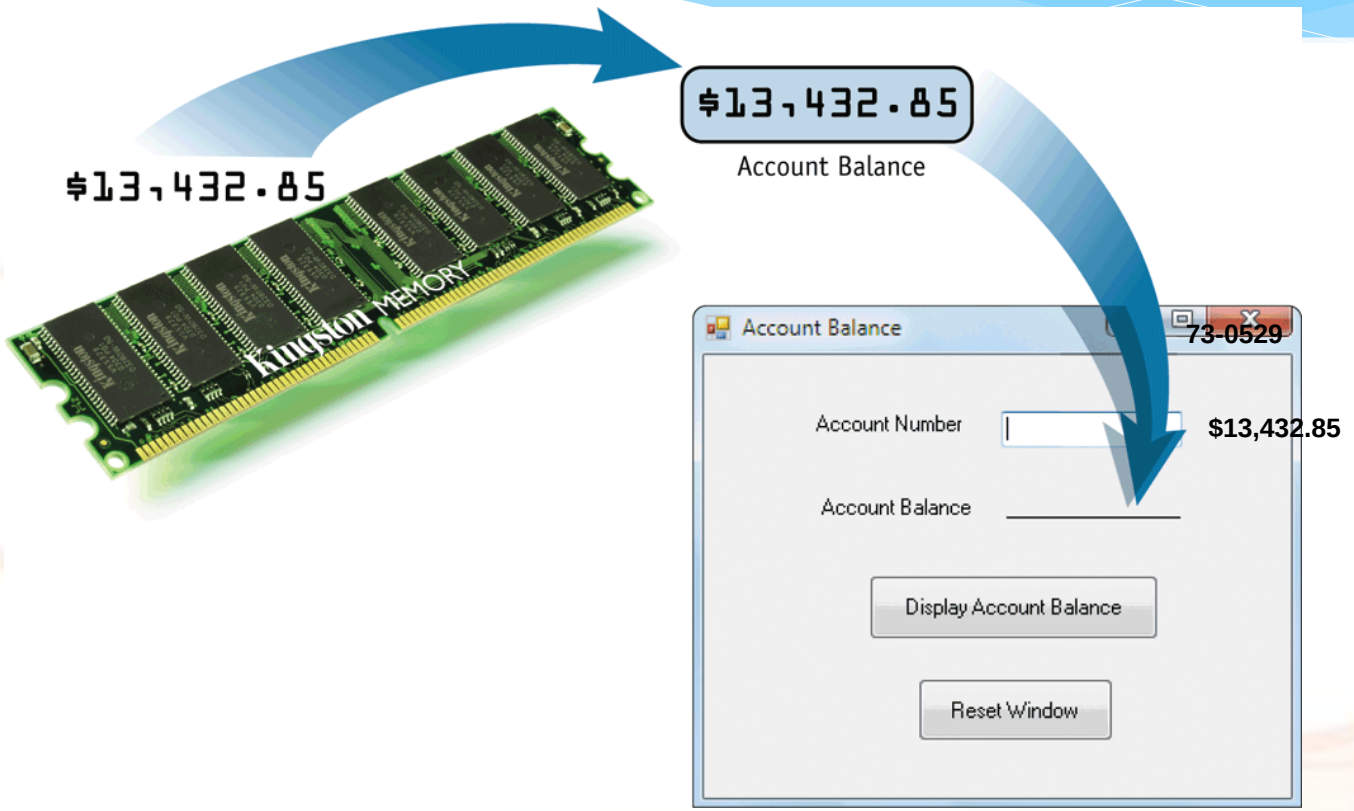
Step 2:
The data is stored in RAM.



Step 3:
Data is displayed on the computer screen.



Output Operation

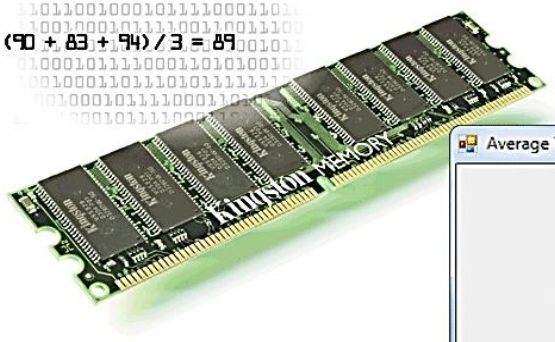


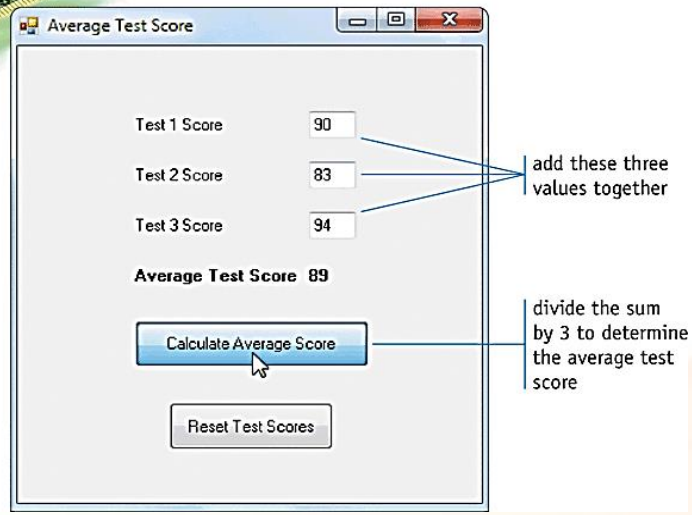
Basic Arithmetic Operations

* In many programs, arithmetic operations are performed on numeric data to produce useful output
  * Addition
  * Subtraction
  * Multiplication
  * Division
  * Exponentiation

Program: (Test 1 Score + Test 2 Score + Test 3 Score) / 3 = Average Test Score

Data: (90 + 83 + 94) / 3 = 89

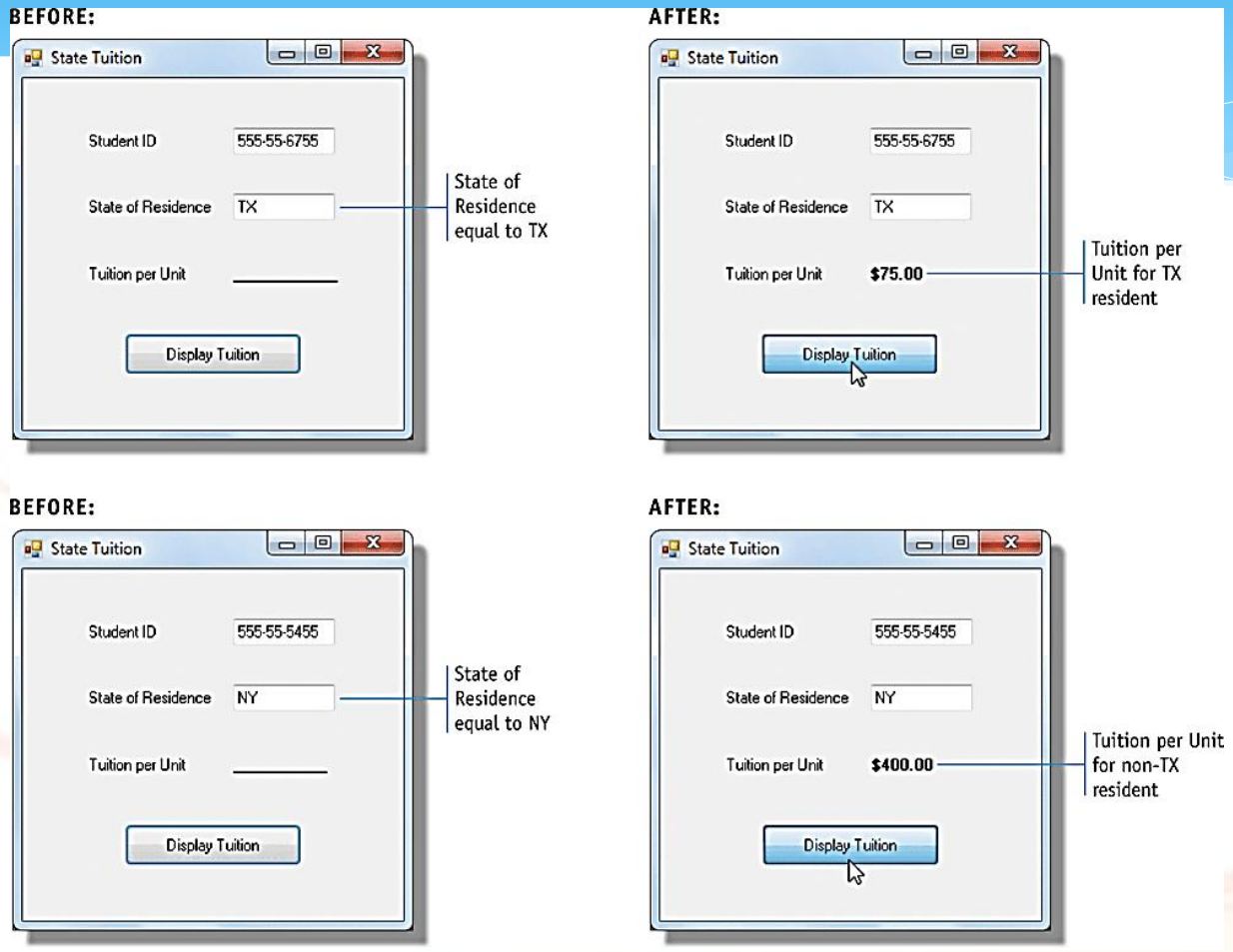




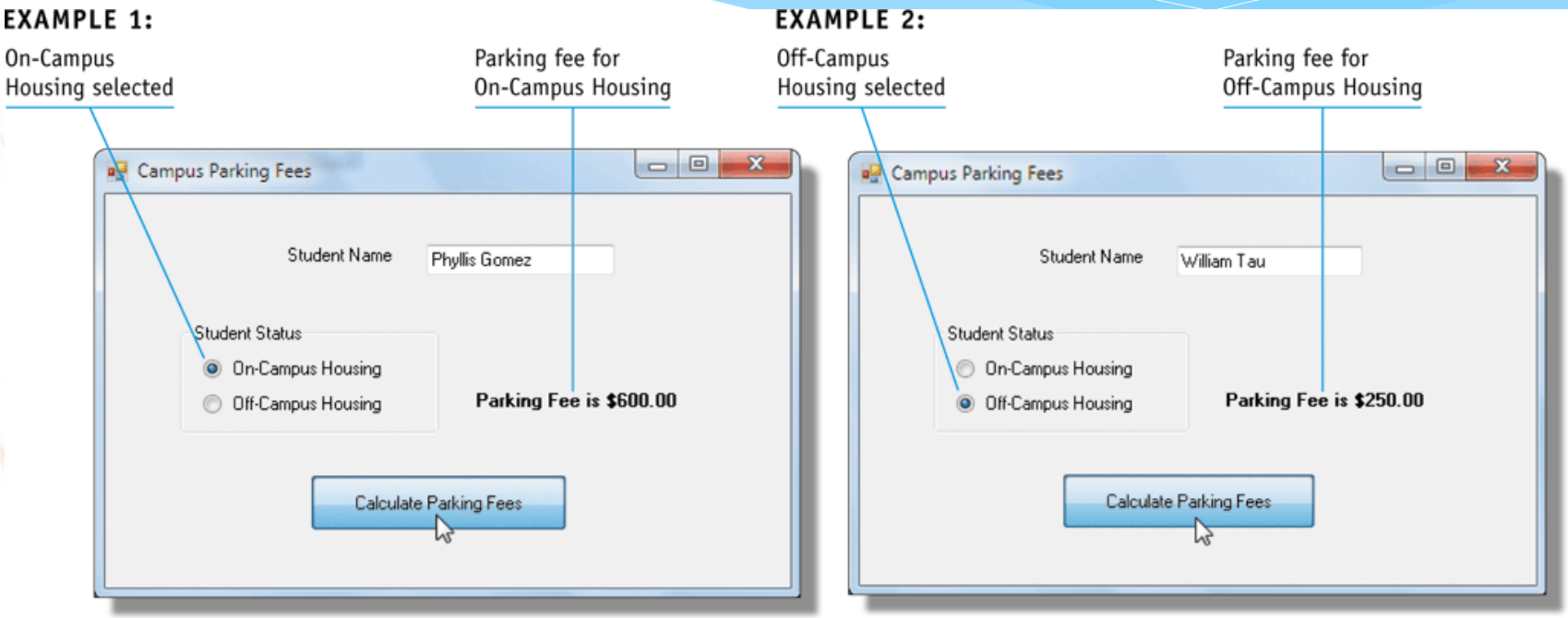
Logical Operations

* Computers, through the use of computer programs, can compare numbers, letters, and special characters
* The program will perform a processing task, based on the result of the comparison
* Logical operations:
  * Comparing to determine if two values are equal
  * Comparing to determine if two values are not equal
  * Comparing to determine if one value is greater than another value
  * Comparing to determine if one value is less than another value

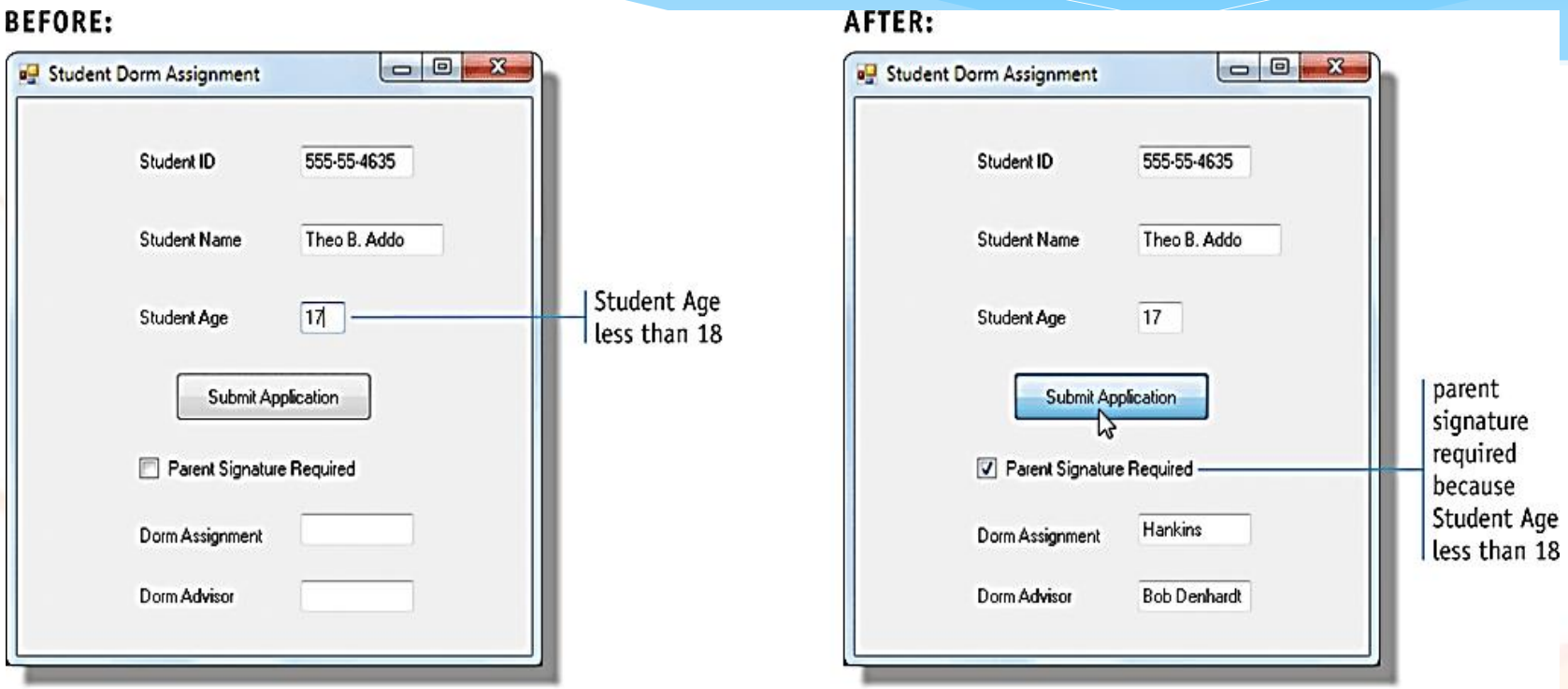
Logical Operations: Equal Condition



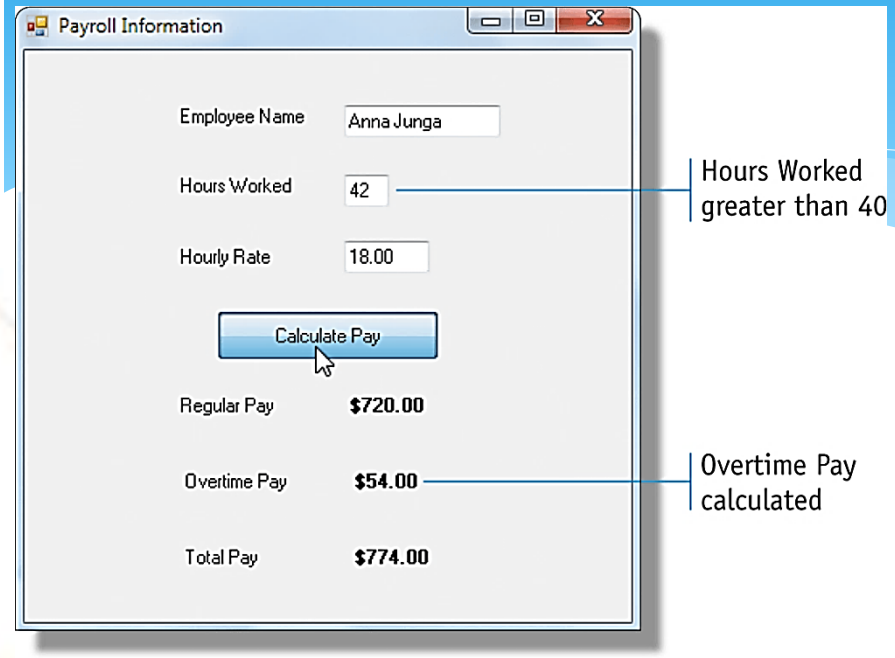
Logical Operations: Equal Condition

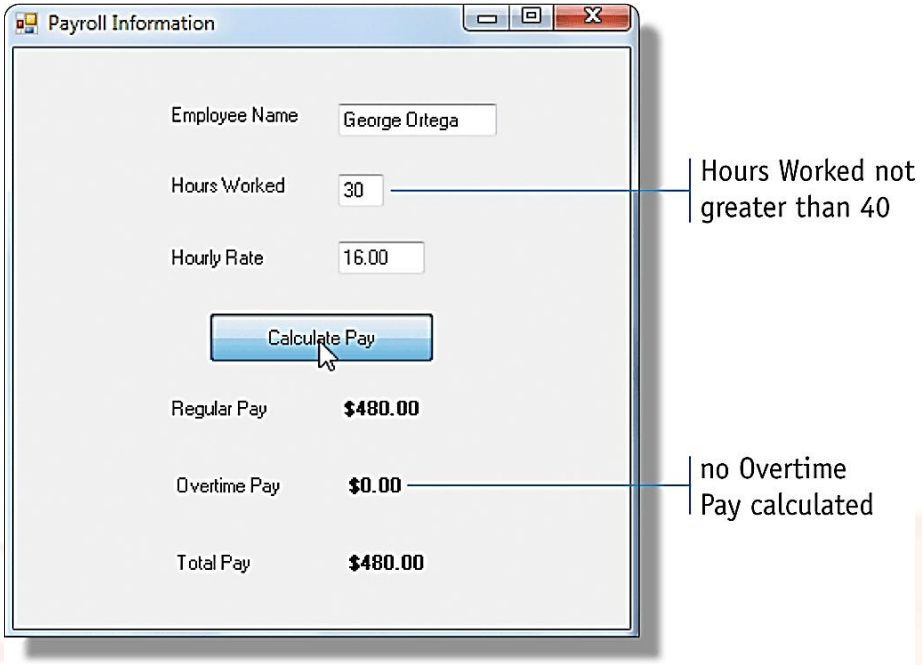


Logical Operations: Less Than Condition



Logical Operations: Greater Than Condition

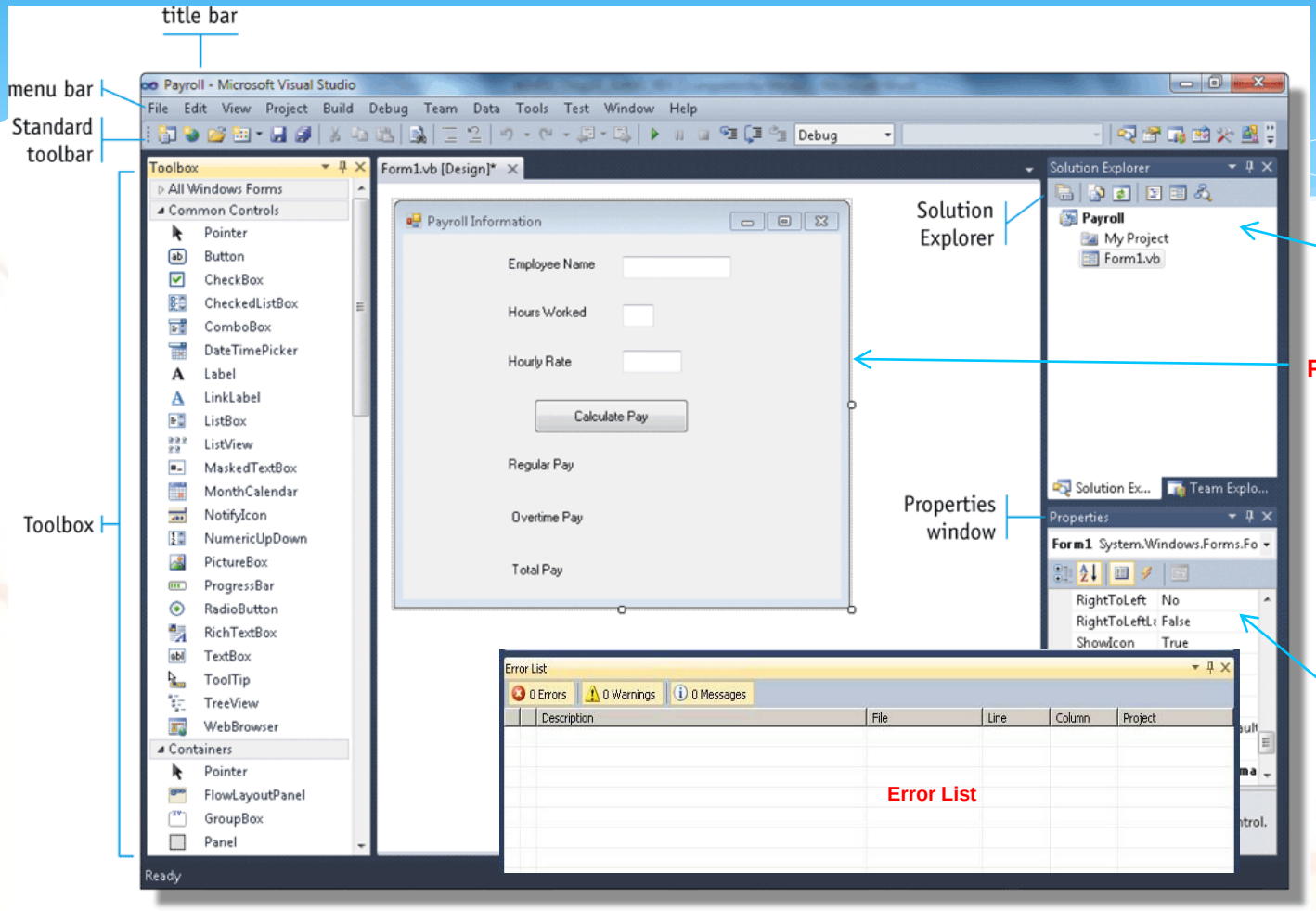




Saving Software and Data

* When you develop and write a program, it must be saved on some type of storage medium (i.e., a disk)
* When you want the program to run, you can cause the program to load into RAM and execute it
* The program you write also can save data
  * Banking applications must save account data
* In most cases, data is stored in a **database**
  * Collection of data organized in a manner that allows access, retrieval, and use of that data
  * However, data can also be saved in a text file

Visual Studio 2010 IDE and Visual Basic 2010



Visual Basic 2010 and Visual Studio 2010

* Each program statement causes the computer to perform one or more operations
* The developer must follow the **syntax**, or **programming rules**, of the programming language precisely
* Many developers use a tool called **Visual Studio 2010** to create Visual Basic 2010 programs
* Visual Studio 2010 is a type of **integrated development environment (IDE)**
  * Provides services and tools that enable a developer to code, test, and implement a single program or series of programs

Programming Languages

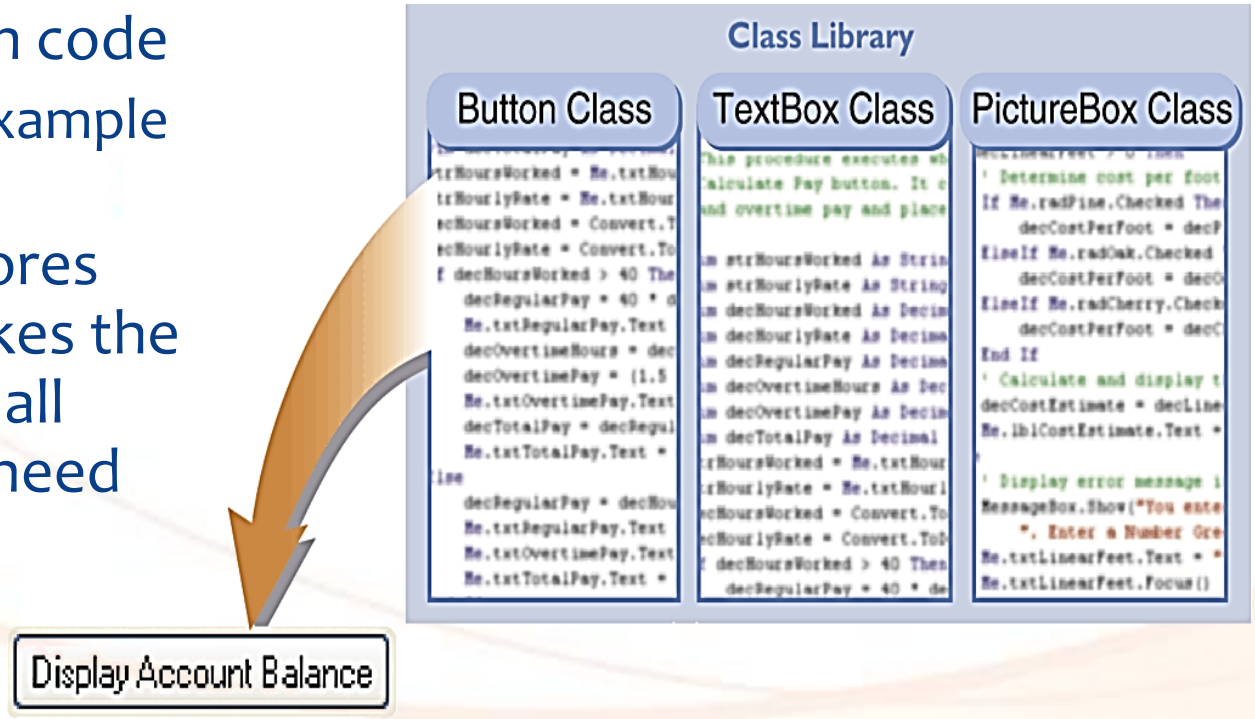
- **Visual Basic**
  - Programming language that allows developers to easily build complex Windows and Web programs, as well as other software tools
  - Based on the BASIC language
- **C++**
  - Derivative of the programming language, C
- **Visual C#** **(pronounced C Sharp)**
  - Synthesis of the elegance and syntax of C++ with many of the productivity benefits enjoyed in Visual Basic
- **Visual F#** **(pronounced F Sharp)**
  - Multipurpose language known for its math-intensive focus

.NET Framework 4.0

* .NET technologies and products were designed to work together to allow businesses to connect information, people, systems, and devices through software
* The **.NET Framework** provides tools and processes developers can use to produce and run programs
  * Most recent version is .NET Framework 4.0

.NET Class Library

* A **class** is a named group of program code
  * A button is an example of a class
* A **class library** stores the class and makes the class available to all developers who need to use it

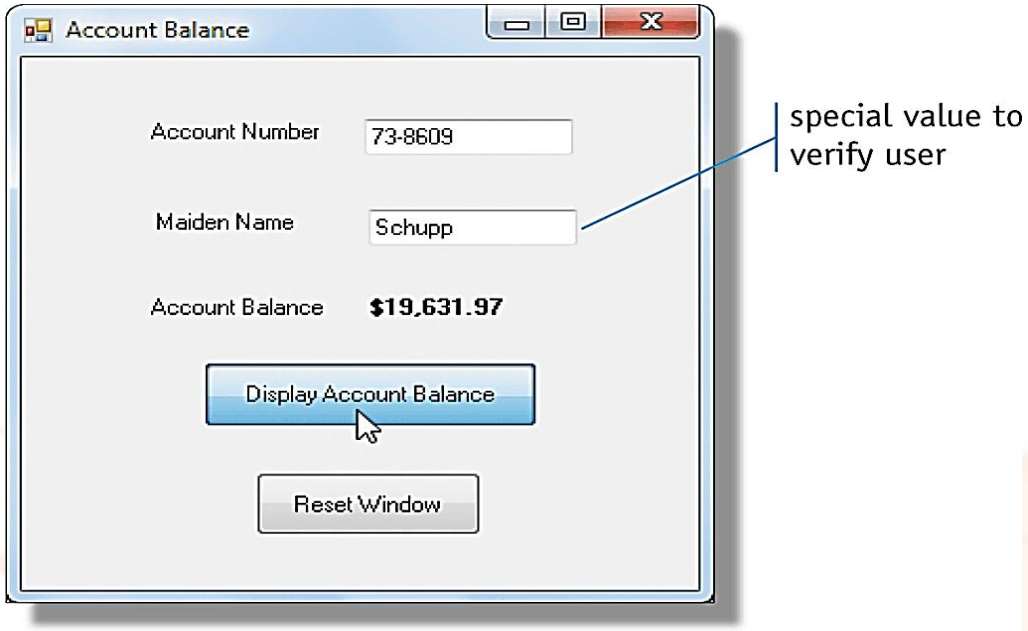


.NET Class Library

* A button created from a class is called an **object**, or sometimes an **instance of a class**
* The process of creating a Button object from the Button class is called **instantiation**
* **Rapid application development (RAD)** refers to the process of using prebuilt classes to make application development faster, easier, and more reliable

ADO.NET 4.0

* **ADO.NET 4.0 (ActiveX Data Objects)** provides the functionality for a program to perform four primary tasks when working with a database:
  * Get the data
  * Examine the data
  * Edit the data
  * Update the data



ASP.NET 4.0

* **ASP.NET 4.0** allows developers to use Visual Studio 2010 to build powerful, sophisticated Web applications
* Almost all .NET framework objects are available in ASP.NET 4.0
* Easy to deploy a Web application on a Web server

Types of Visual Basic 2010 Applications

* **Windows application**
  * Program will run on a computer or other device that supports the Windows GUI
* **Mobile application**
  * Designed to run on mobile devices running the Windows CE operating system
* **Web site application**
  * Uses ASP.NET 4.0 and runs on a Web server

Types of Visual Basic 2010 Applications

* **Office application**
  * Includes writing Visual Basic 2010 code to automate and manipulate documents created using Microsoft Office 2003, Office 2007, and Office 2010
* **Database application**
  * Written using ADO.NET 4.0 to reference, access, display, and update data stored in a database
* Other types of applications include console applications, classes for class libraries, certain controls to use in Windows applications, Web services, and device-specific applications

Summary

* Understand software and computer programs
* State the role of a developer in creating computer programs
* Specify the use of a graphical user interface and describe an event-driven program
* Specify the roles of input, processing, output, and data when running a program on a computer
* Describe the arithmetic operations a computer program can perform

Summary

* Explain the logical operations a computer program can perform
* Define and describe the use of a database
* Identify the use of a computer programming language in general, and Visual Basic 2010 in particular
* Explain the use of Visual Studio 2010 when developing Visual Basic 2010 programs
* Specify the programming languages available for use with Visual Studio 2010

Summary

* Explain the .NET 4.0 Framework
* Describe classes, objects, and the .NET Framework 4.0 class libraries
* Explain ADO.NET 4.0, ASP.NET 4.0
* Specify the types of Visual Basic 2010 applications

2. Basic, Controls, and Events

Microsoft Visual Basic 2010 programming

2. Visual Basic, Controls, and Events

1 Reason for Visual Basic

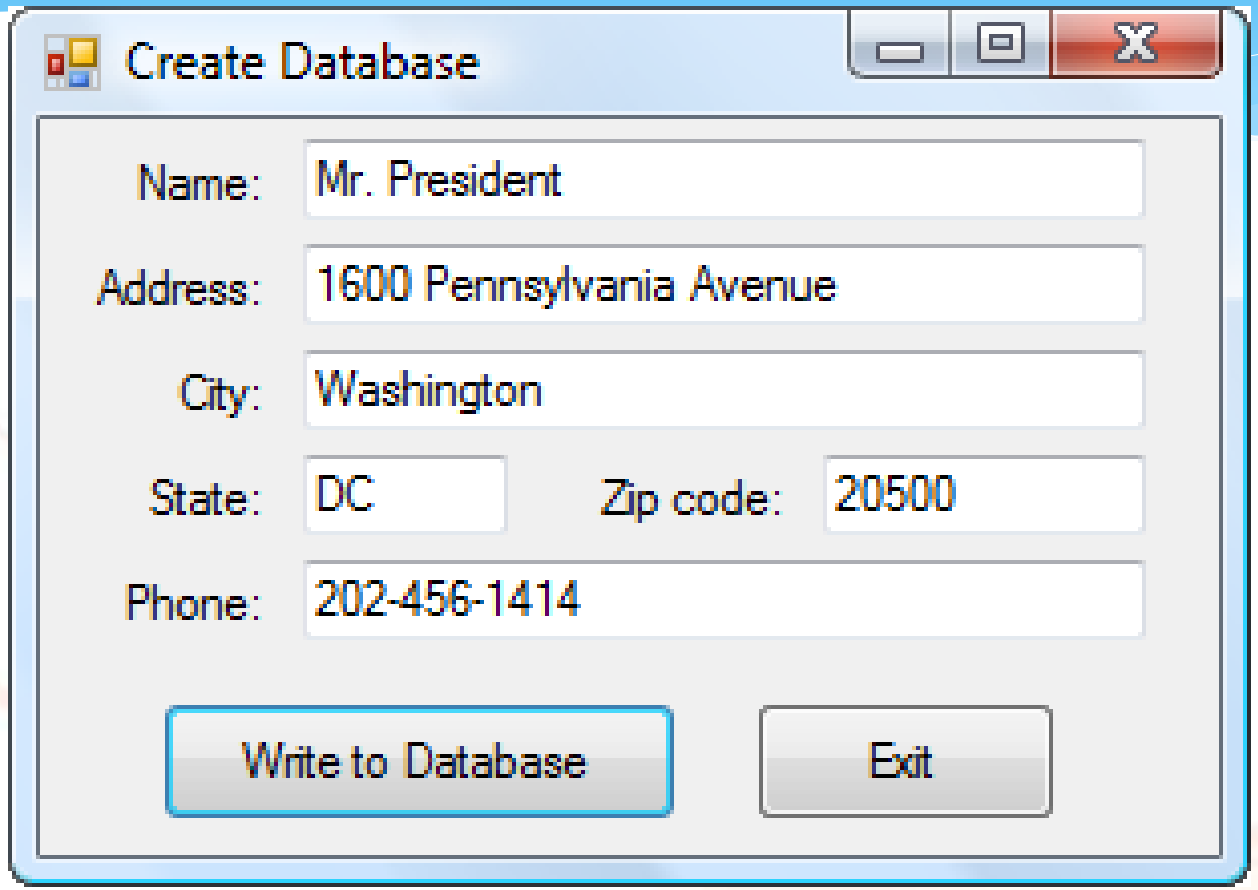
2 Visual Basic Controls

3 Visual Basic Events

Why Visual Basic 2010?

* Why Windows and Why Visual Basic
* How You Develop a Visual Basic Application
* The Different Versions of Visual Basic
* Language used to create Windows applications.
* Provides a **G**raphical **U**ser **I**nterface or GUI.
* The sequence of instructions executed in the program is controlled by events.

Sample Input Screen



How to Develop a Visual Basic Application

* Design the Interface for the user.
* Determine which events the controls on the window should recognize.
* Write the event procedures for those events.

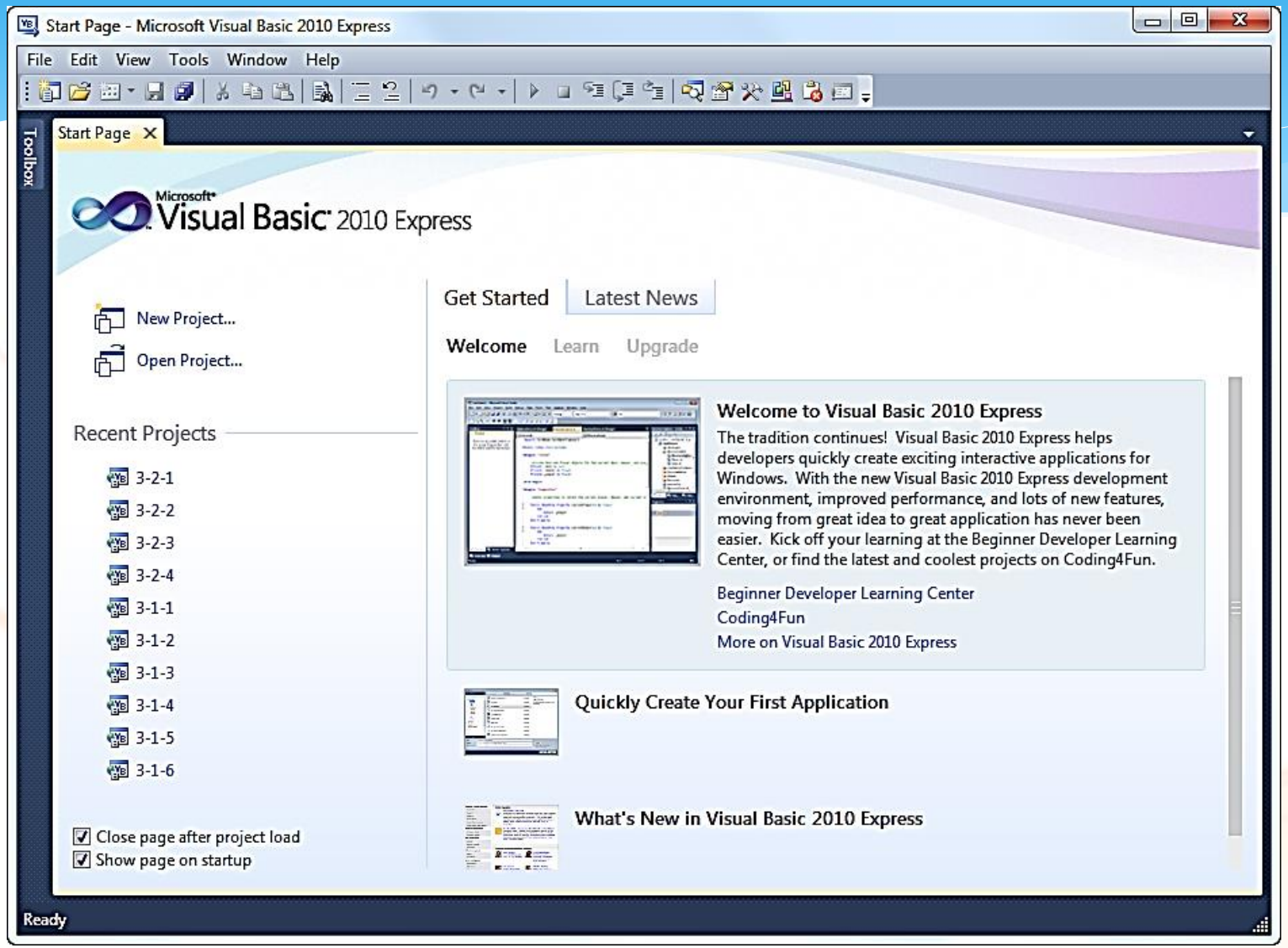
Different Versions of Visual Basic

* Version 1.0 – 1991
* Version 2.0 – 1992
* Version 3.0 – 1993
* Version 4.0 – 1995
* Version 5.0 – 1997
* Version 6.0 – 1998
* Visual Basic.NET – 2002 (NOT BACKWARD COMPATIBLE WITH EARLIER VERSIONS)
* Visual Basic 2005 – November 2005
* Visual Basic 2008 – November 2007
* Visual Basic 2010 – April 2010

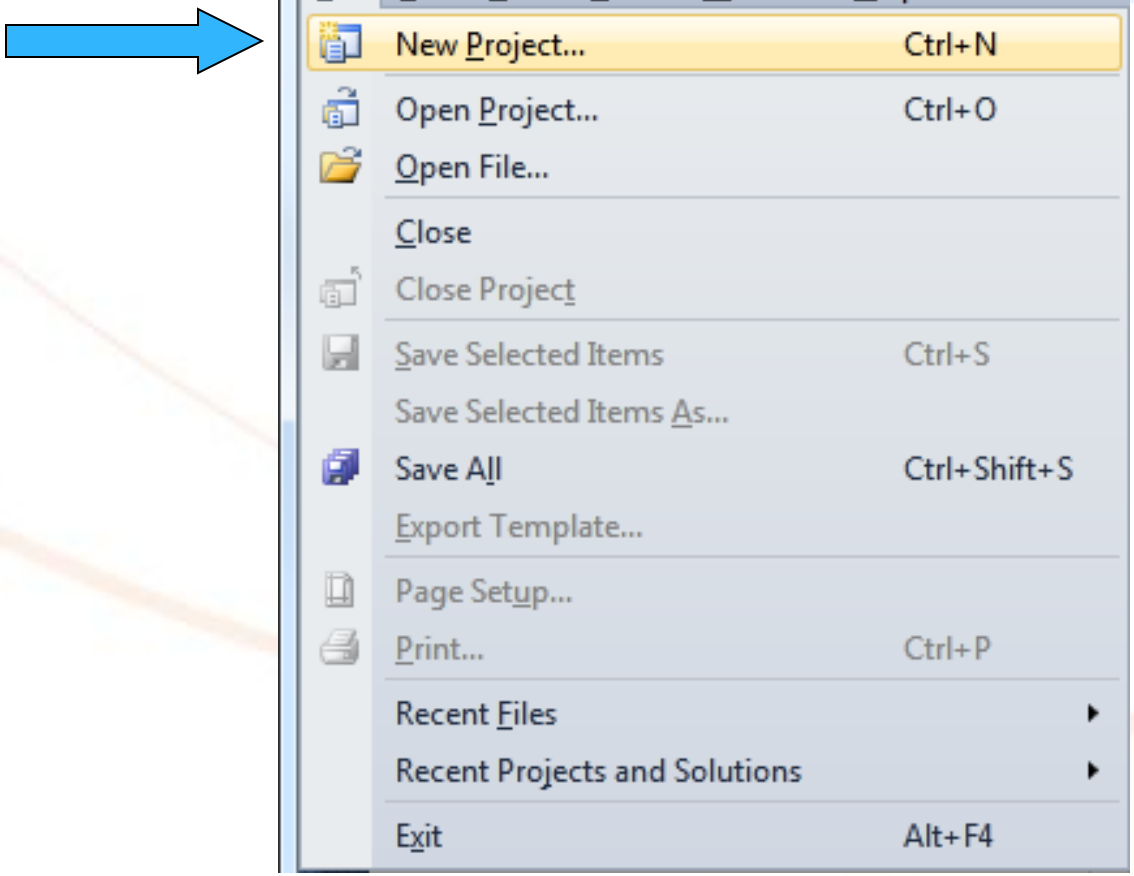
Visual Basic Controls

* Starting a New Visual Basic Program
* Text Box Control
* Button Control
* Label Control
* List Box Control
* Name Property
* Fonts / Auto Hide
* Positioning and Aligning Controls

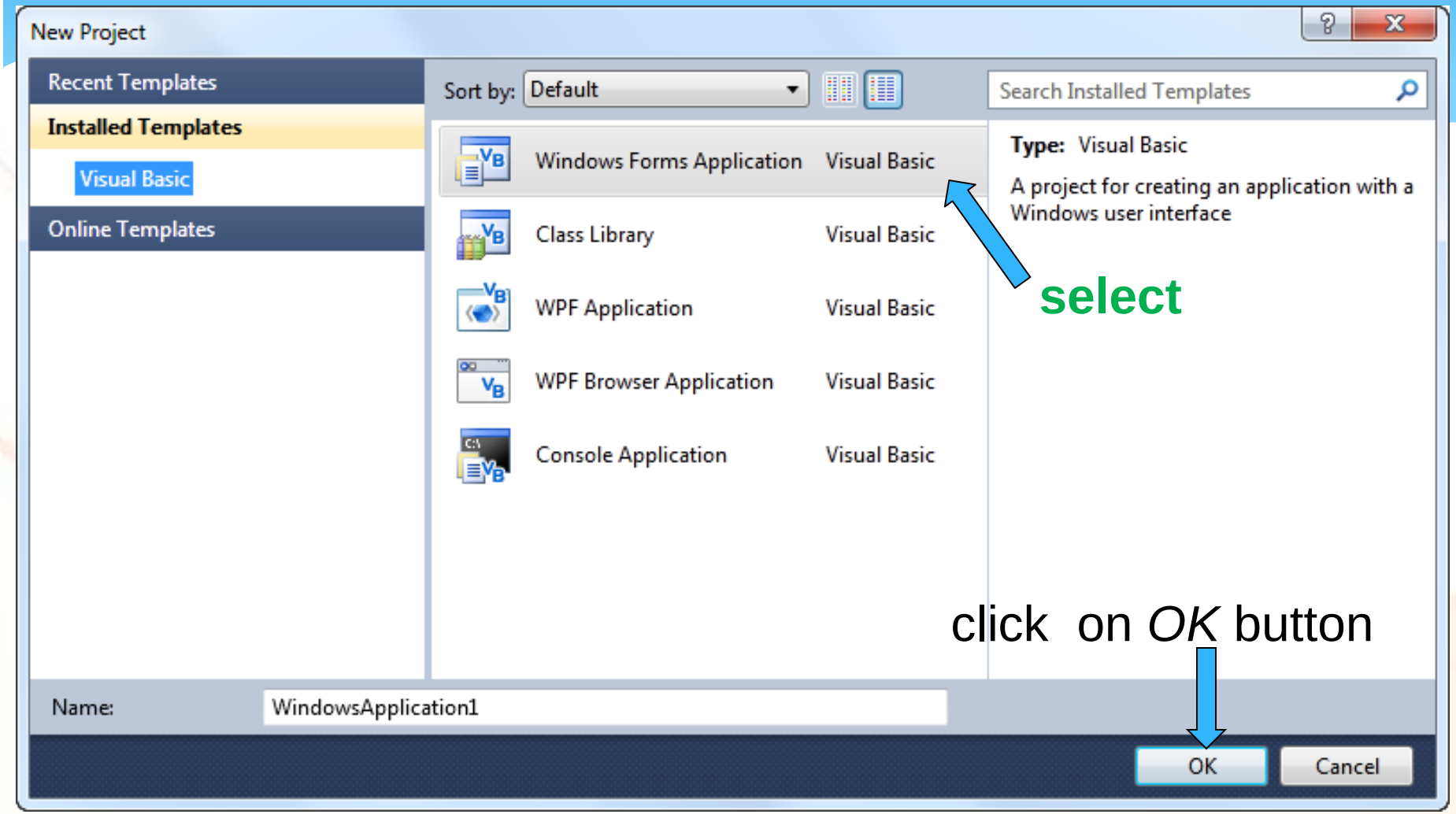
Visual Basic Start Page



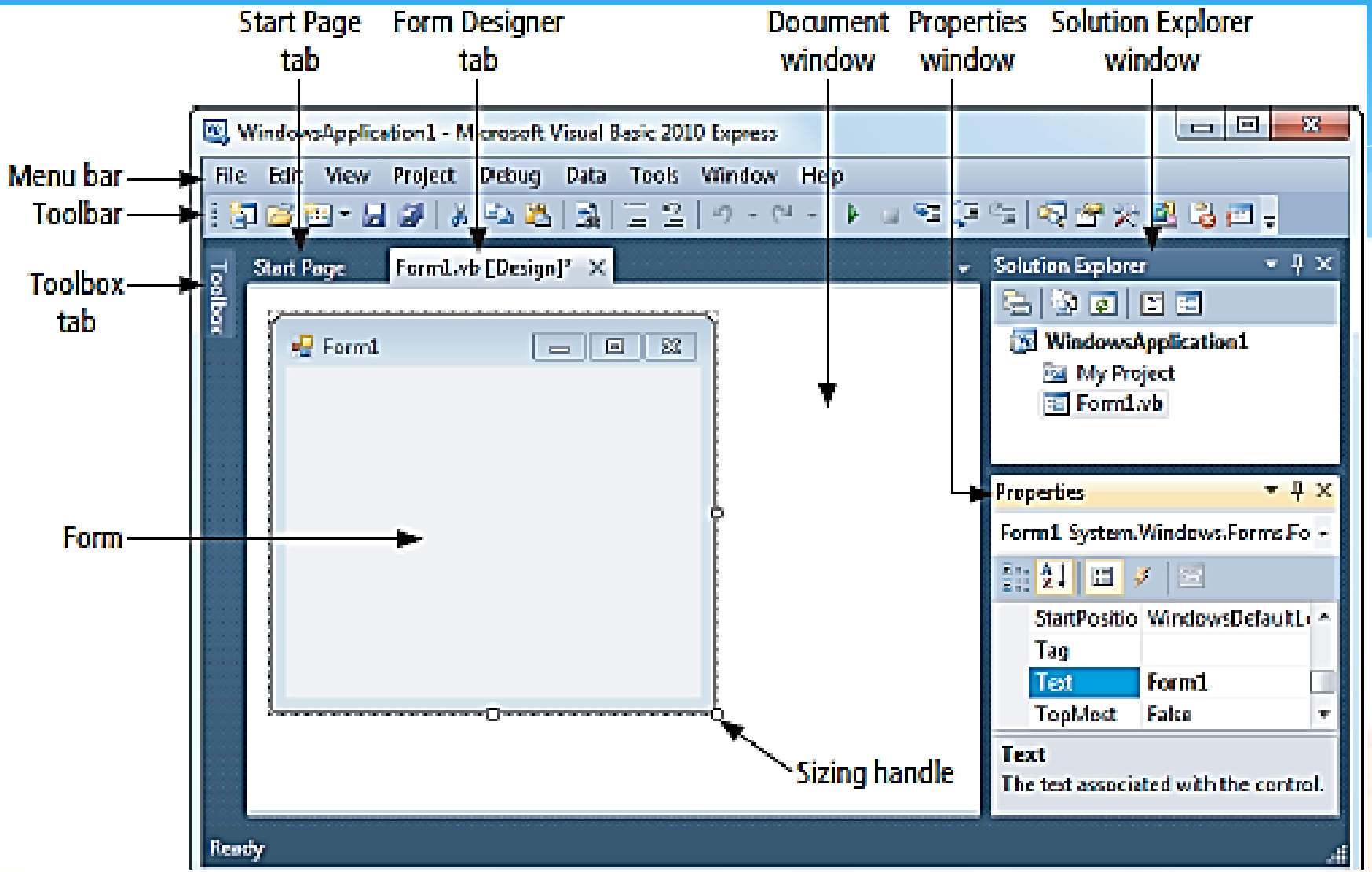
Start a New Project



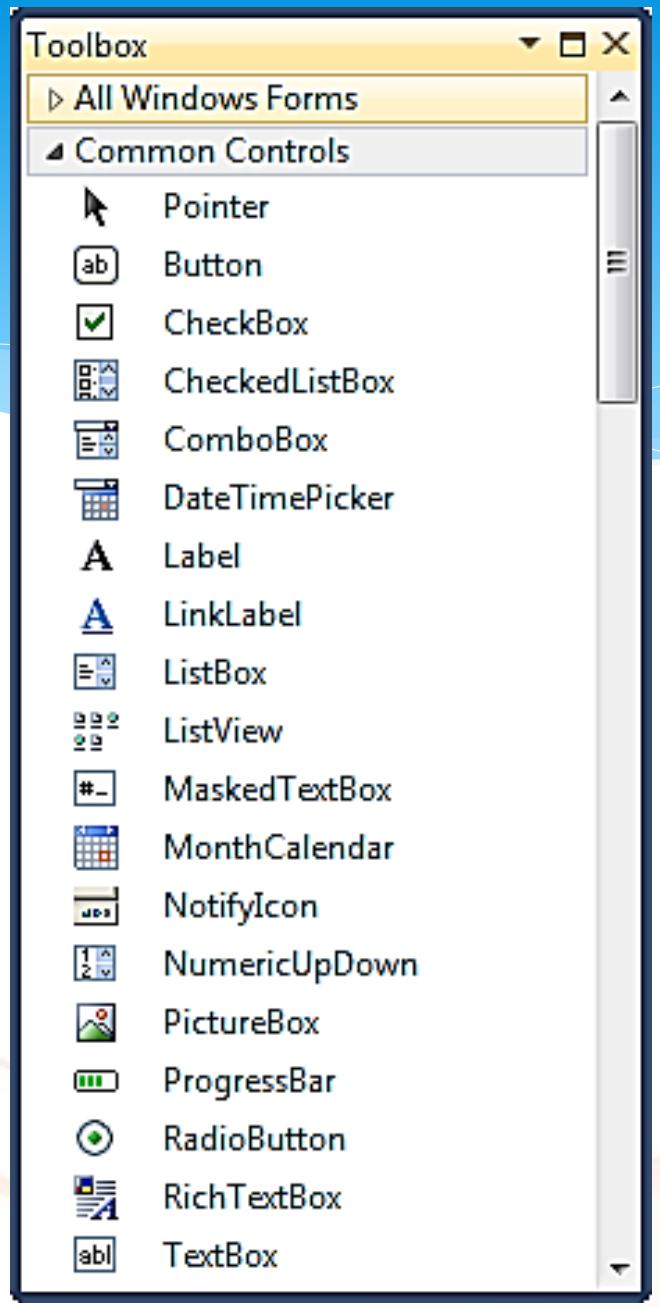
New Project Dialog Box



Initial Visual Basic Screen



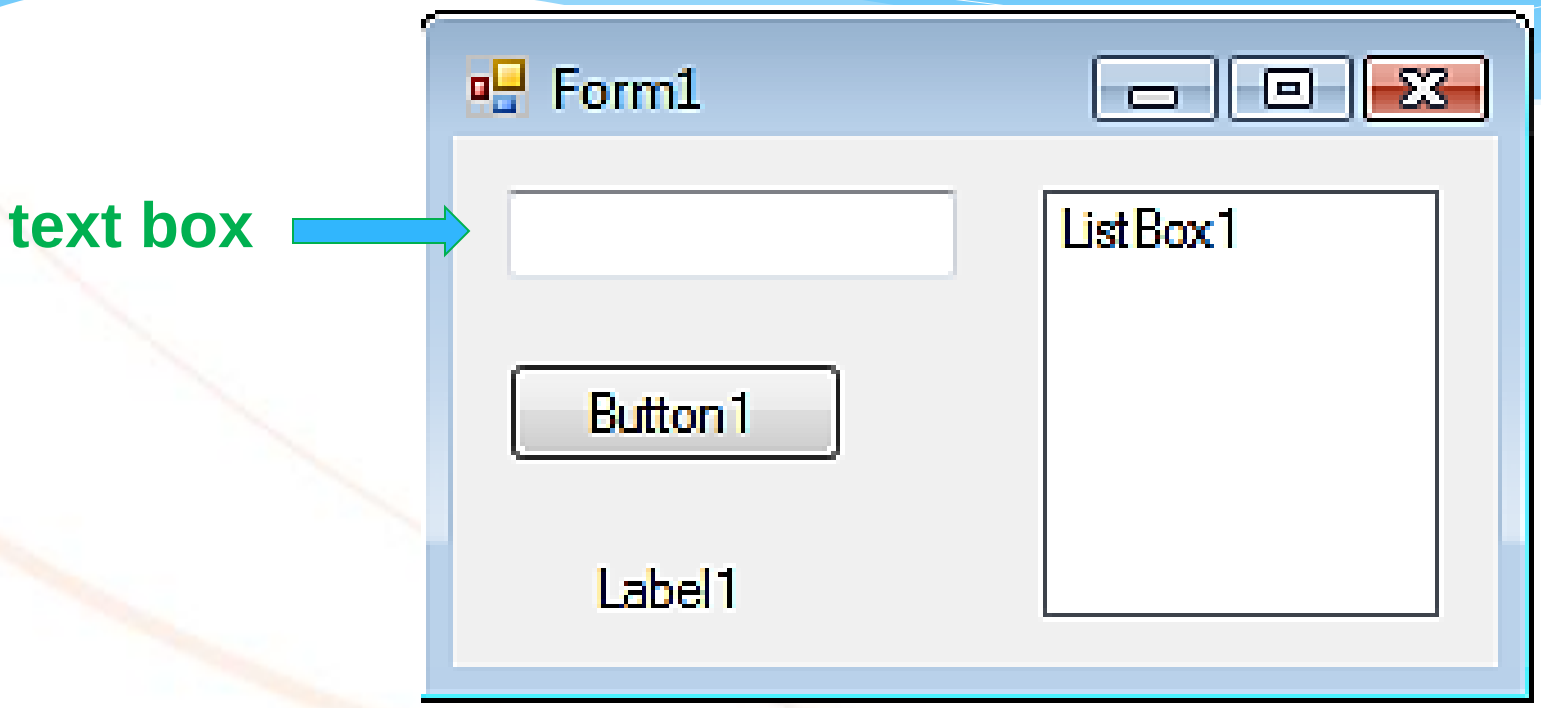
Toolbox


Toolbox
All Windows Forms
Common Controls
Pointer
Button
CheckBox
CheckedListBox
ComboBox
DateTimePicker
Label
LinkLabel
ListBox
ListView
MaskedTextBox
MonthCalendar
NotifyIcon
NumericUpDown
PictureBox
ProgressBar
RadioButton
RichTextBox
TextBox

4 Ways to Place a Control from the Toolbox onto the Form Designer

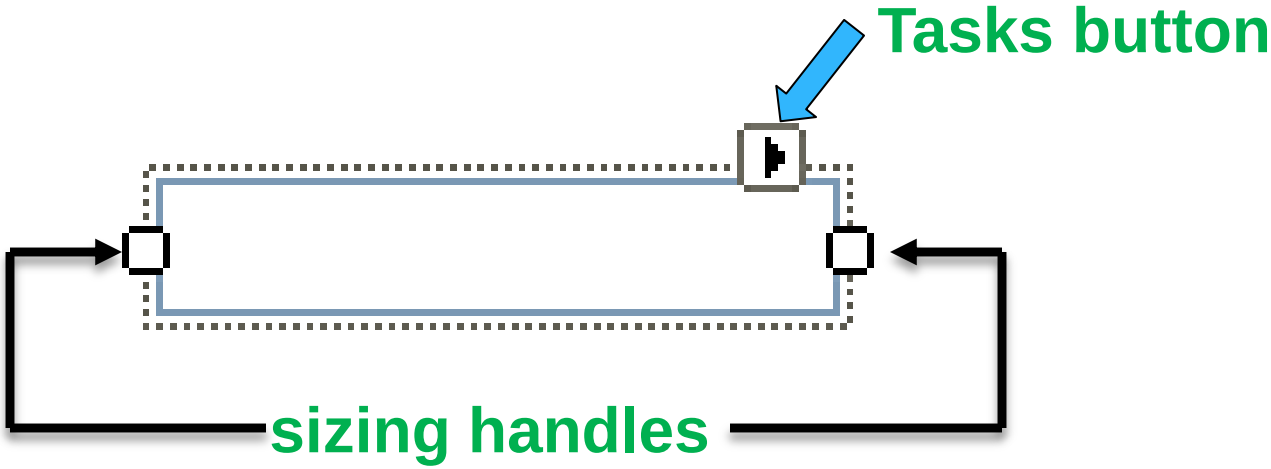
* Double-click
* Drag and Drop
* Click, Point, and Click
* Click, Point, and Drag

Four Controls at Design Time

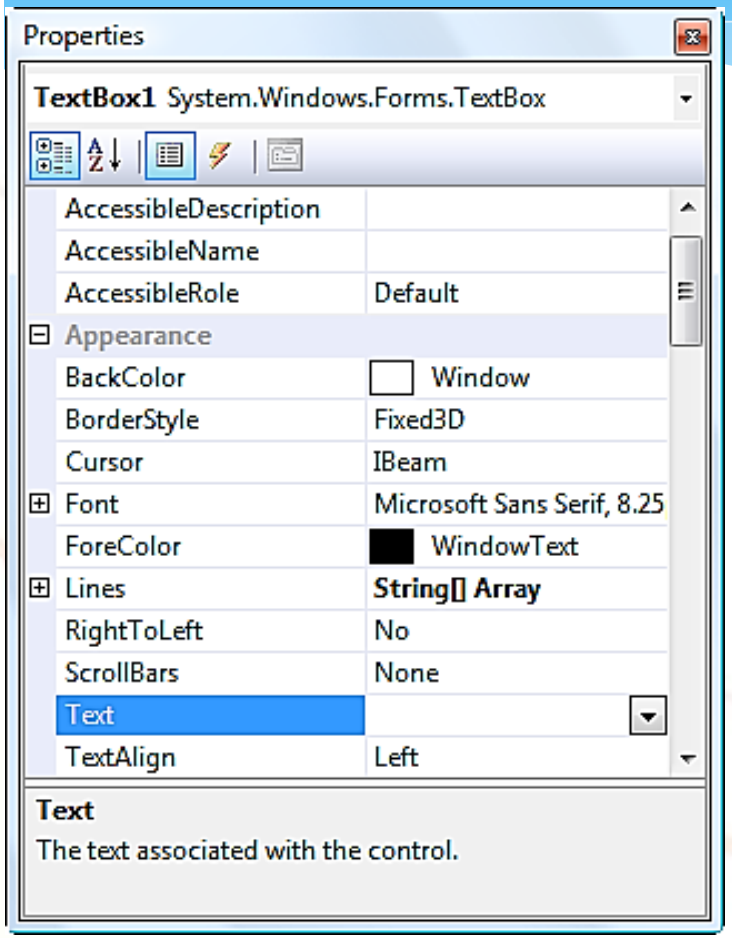


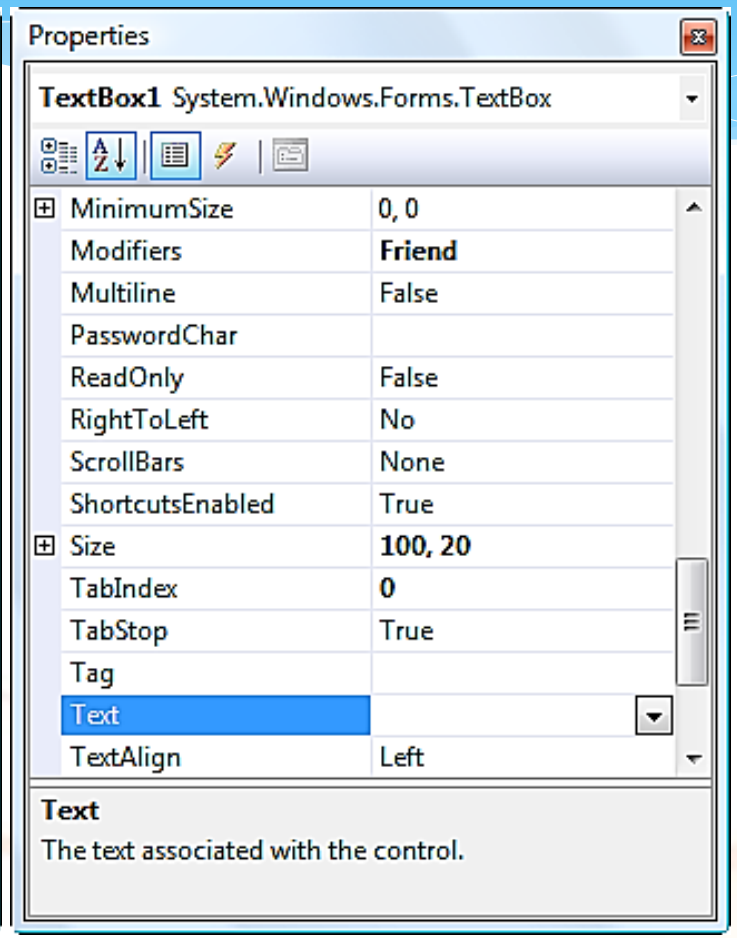
To select a control, click on it. Sizing handles will appear when a control is selected.

* Used for input and output
* When used for output, ReadOnly property is set to True



Properties Window



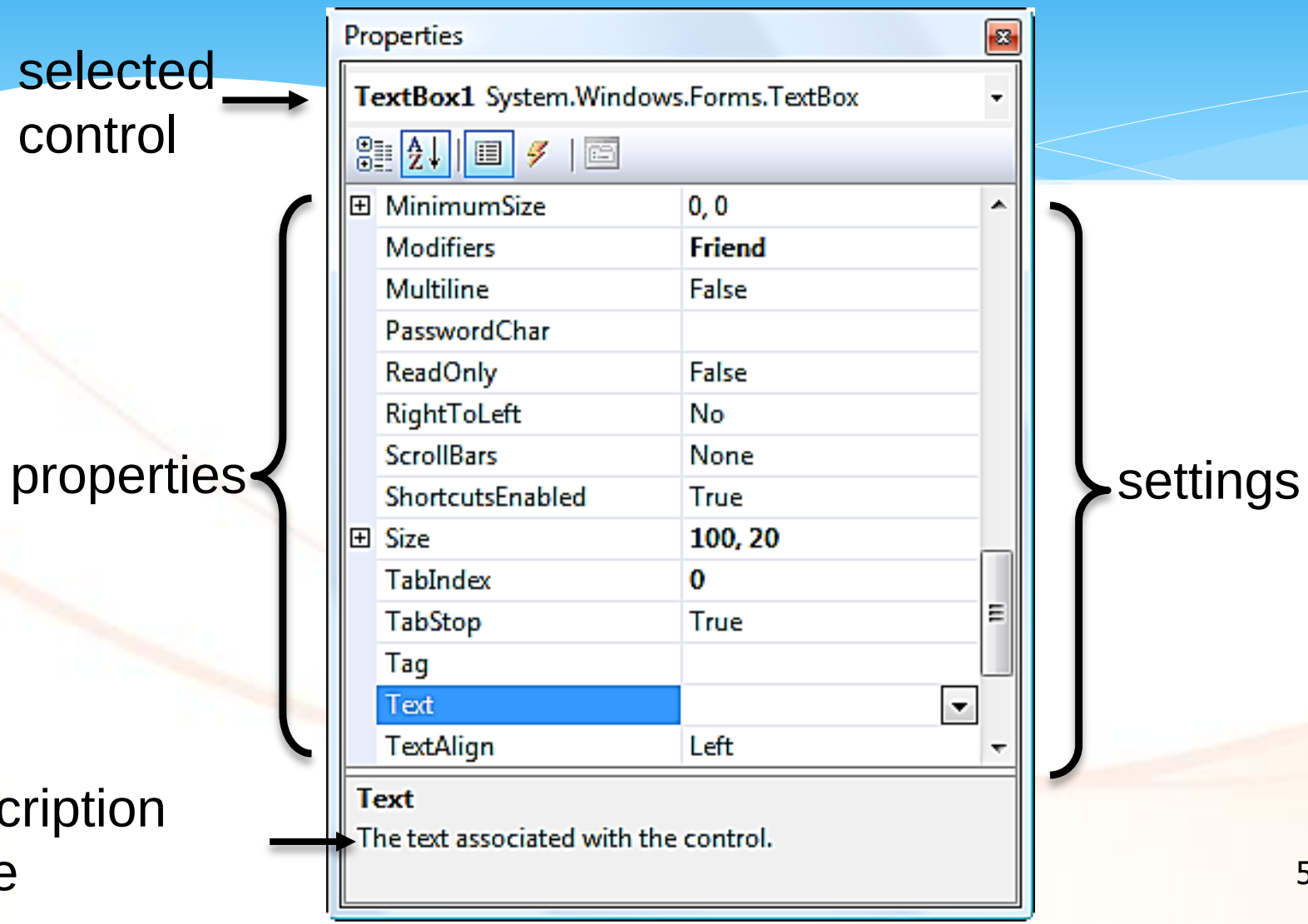


Press F4 to display the Properties window for the selected control.

categorized view

alphabetical view

Properties Window (continued)



Some Often Used Properties

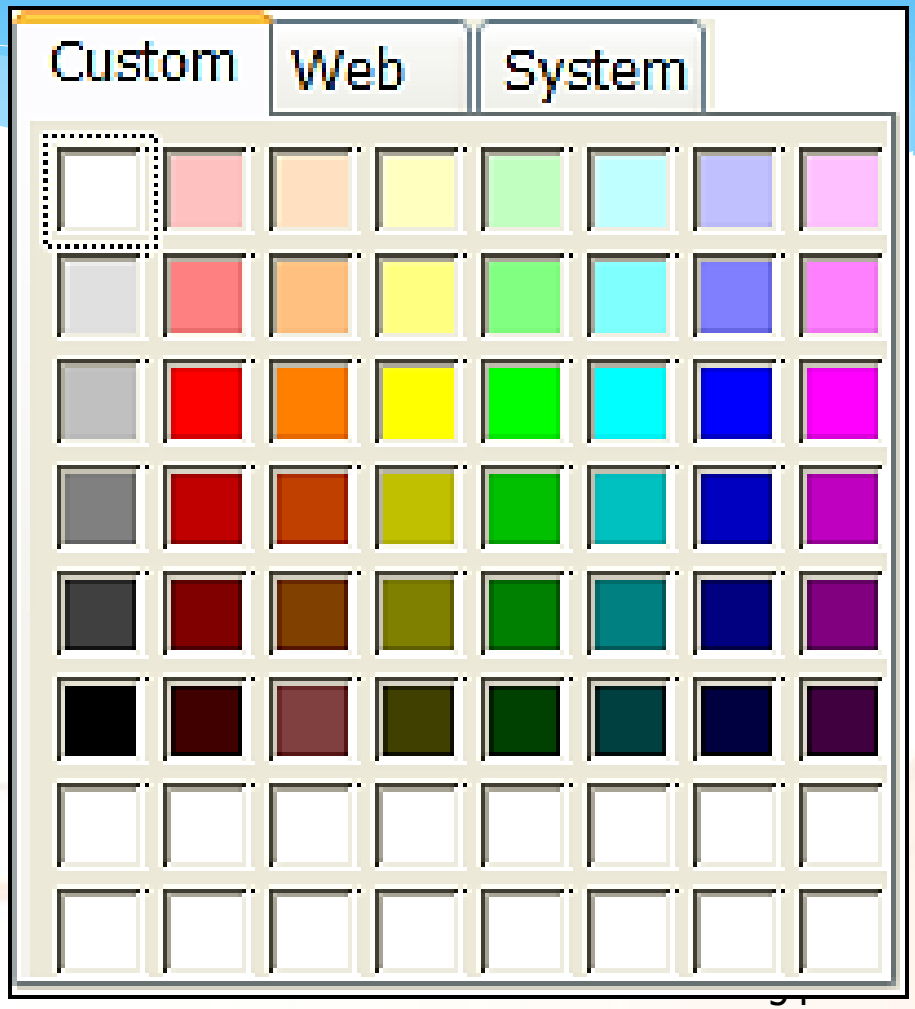
* Text
* Autosize
* Font.Name
* Font.Size
* ForeColor
* BackColor
* ReadOnly

Setting Properties

* Click on property name in left column.
* Enter its setting into right column by typing or selecting from options displayed via a button or ellipses.

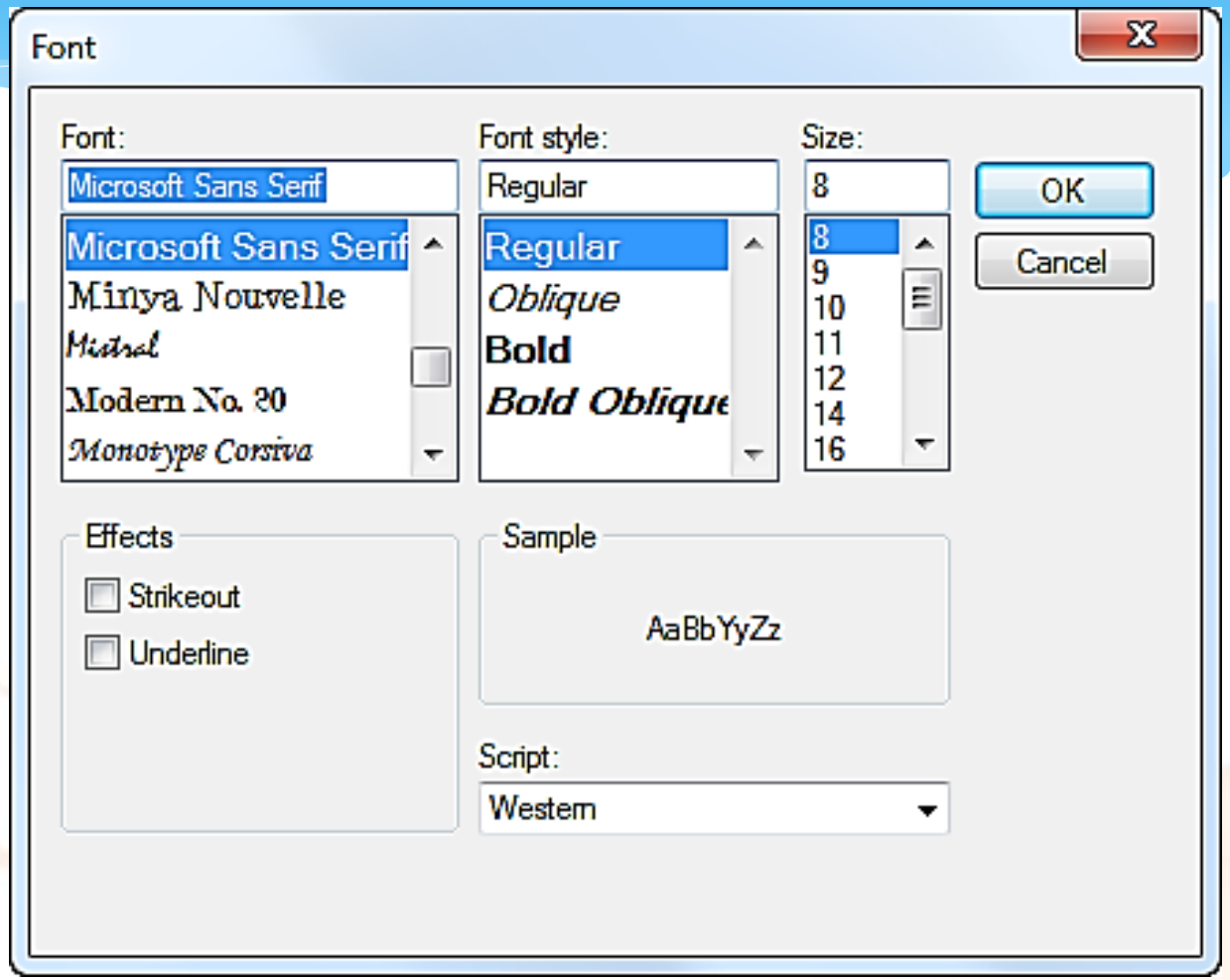
Setting the ForeColor Property

1. Click on ForeColor.
2. Click on button at right of settings box.
3. Click on Custom tab to obtain display shown.
4. Click on a color.



Font Property

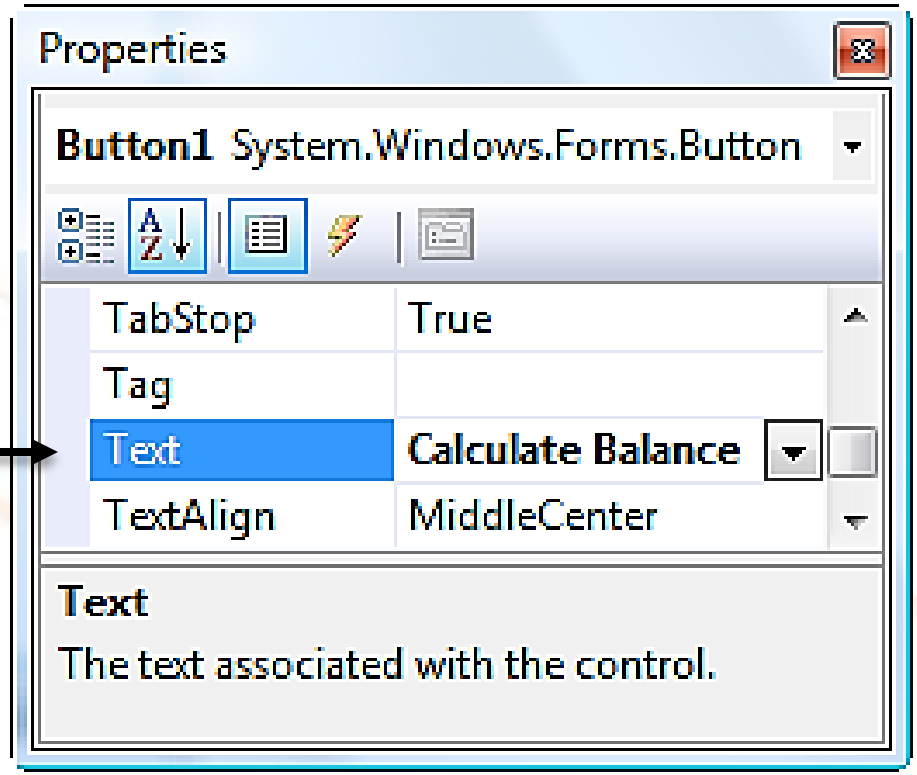
1. Click on Font in left column.
2. Click on ellipsis at right of settings box to obtain display shown.
3. Make selections.

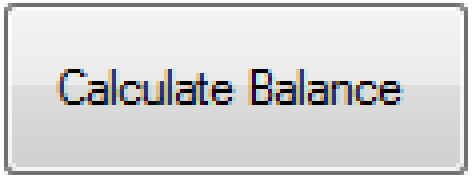


Button Control

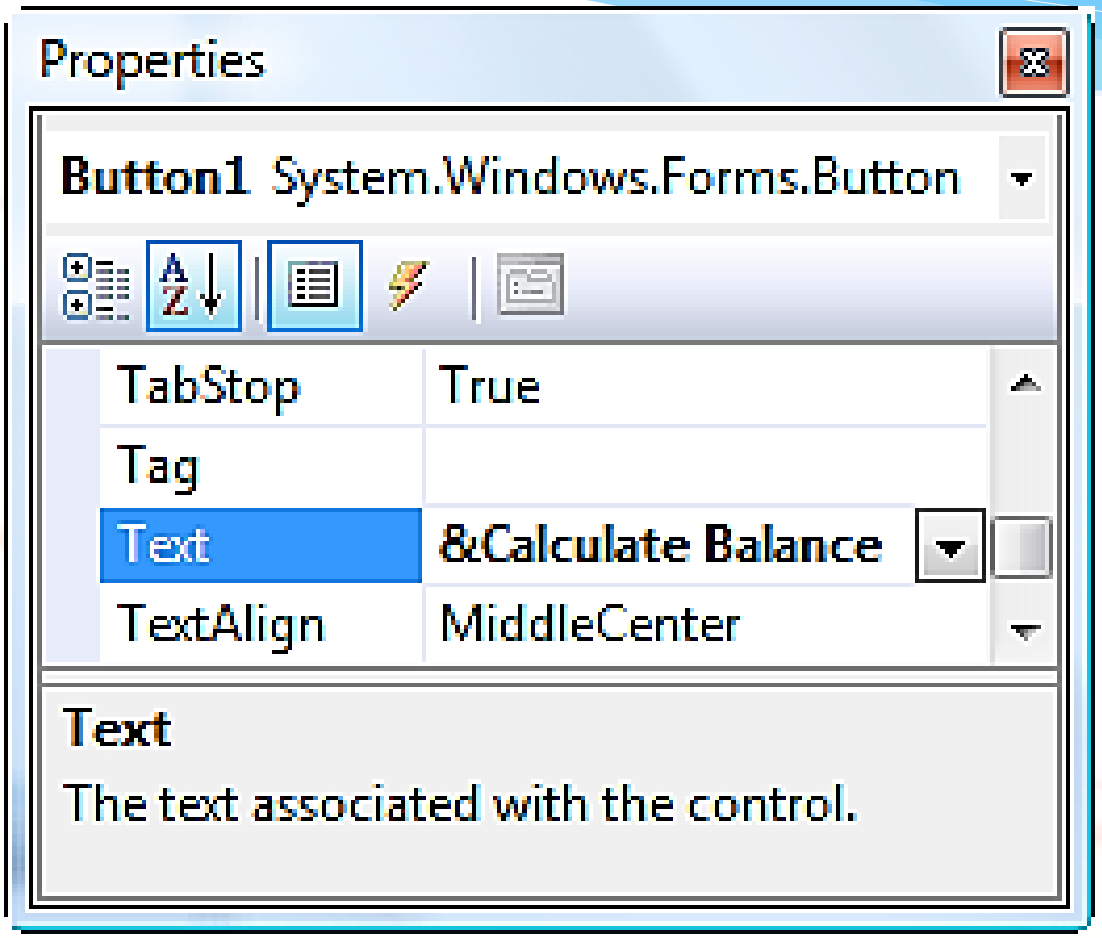
* The caption on the button should indicate the effect of clicking on the button.

Text property





Add an Access Key



Label Control

* Used to identify the contents of a text box.
* Text property specifies caption.
* By default, label automatically resizes to accommodate caption on one line.
* When the AutoSize property is set to False, label can be resized manually. AutoSize is used primarily to obtain a multi-rowed label.

List Box Control

* Initially used to display several pieces of output.
* In Chapter 4 used to select from a list.

The Name Property

* Used by the programmer to refer to a control in code
* Setting for Name property near top of Properties window
* Use appropriate 3-character naming prefix
* Use descriptive names

Control Name Prefixes

Control	Prefix	Example
button	btn	btnCompute
label	lbl	lblAddress
text box	txt	txtAddress
list box	lst	lstOutput

Renaming the Form

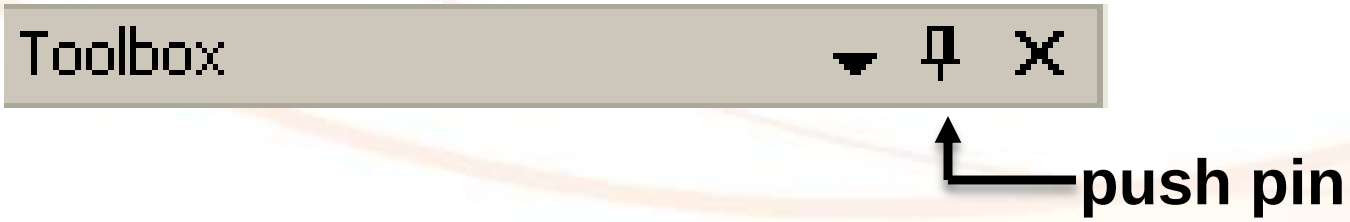
* Initial name is Form1
* The Solution Explorer window lists a file named Form1.vb.
* To rename the form, change the name of this file to *newName*.vb
* *newName* should begin with prefix *frm*.

Fonts

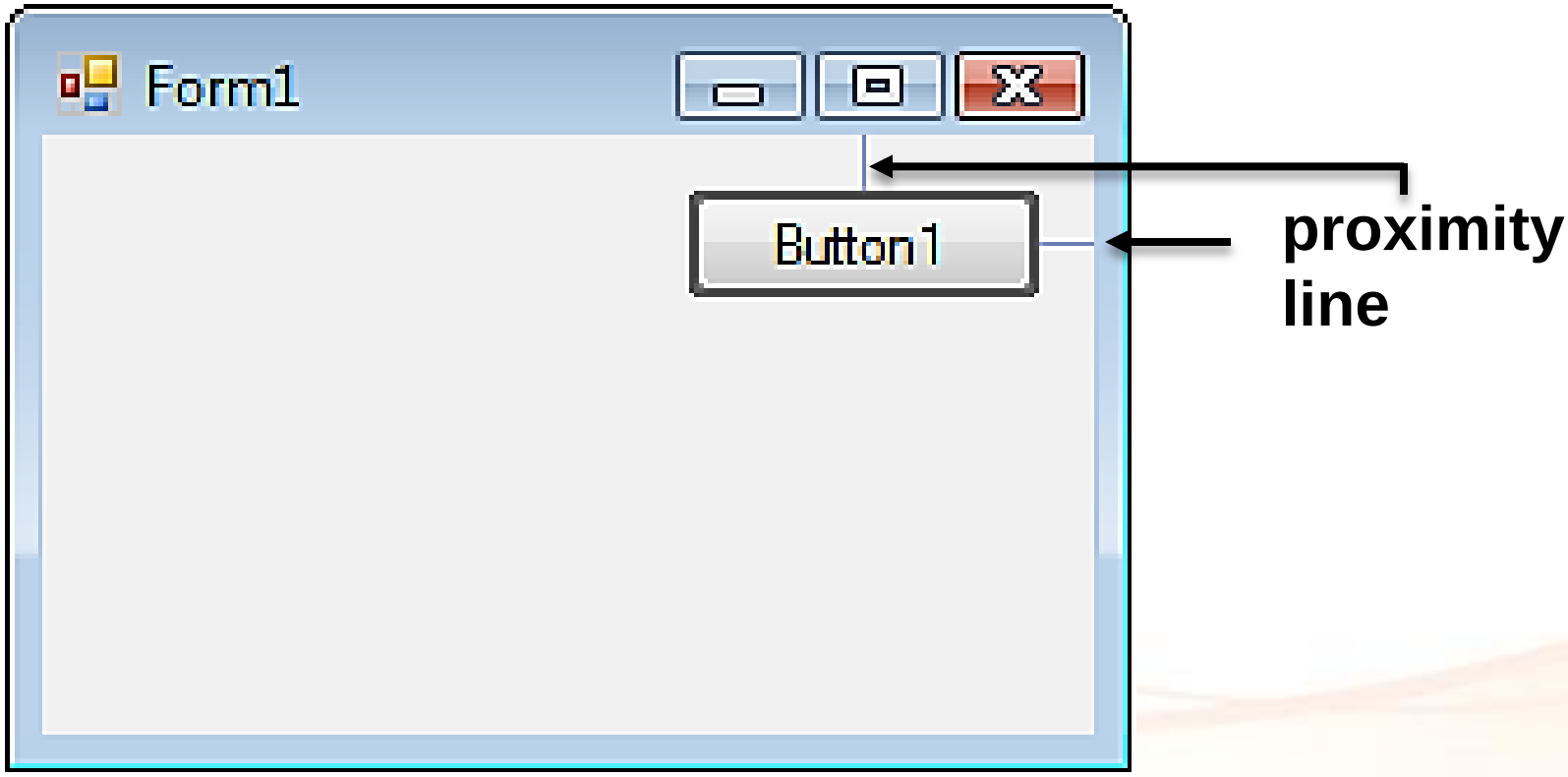
* Proportional width fonts, such as Microsoft Sans Serif, use less space for "I" than for "W"
* Fixed-width fonts take up the same amount of space for each character – like Courier New
* Fixed-width fonts are used for tables.

Auto Hide

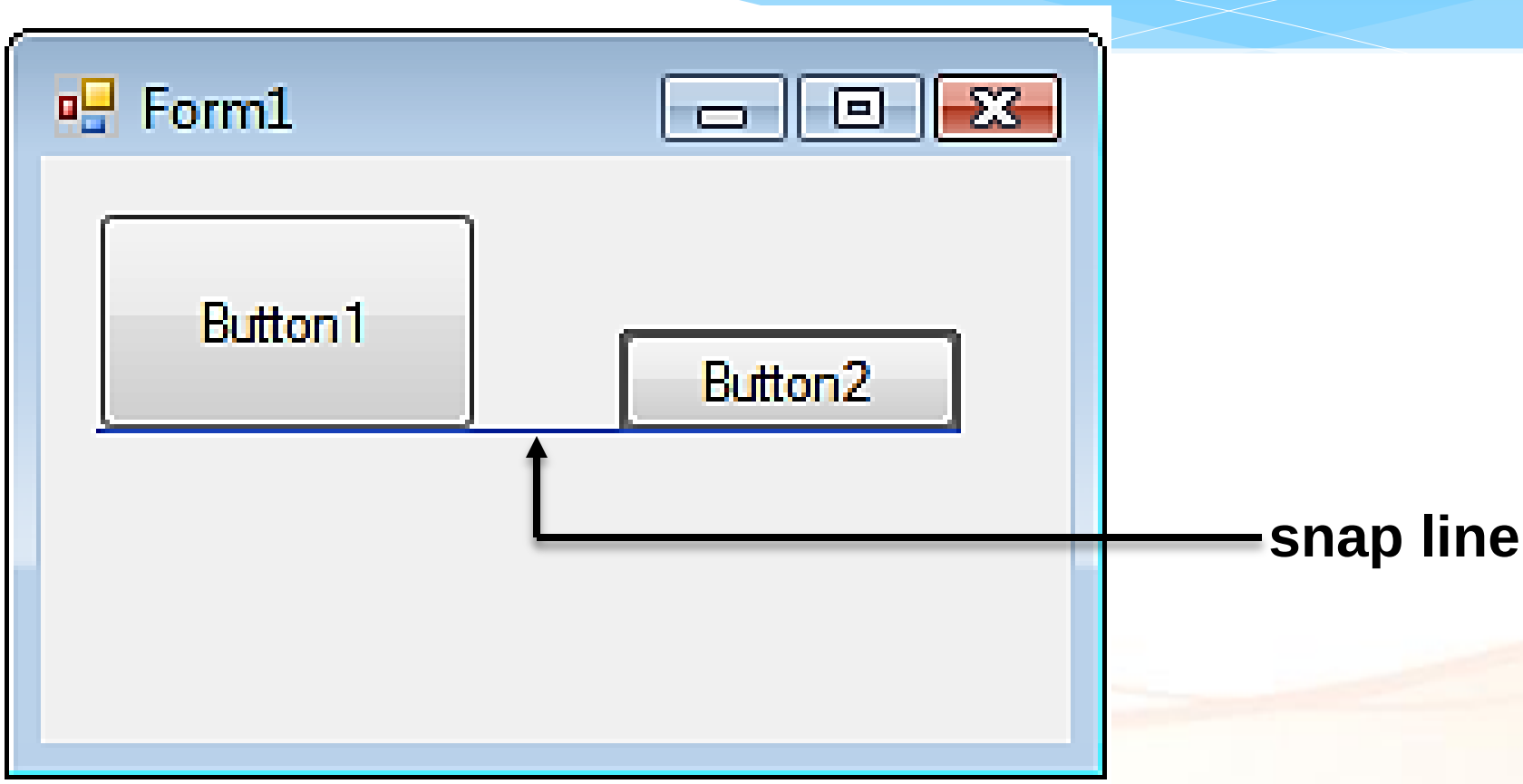
* Hides Toolbox when not in use
* Vertical push pin icon indicates auto hide is disabled.
* Click the push pin to make it horizontal and enable auto hide.



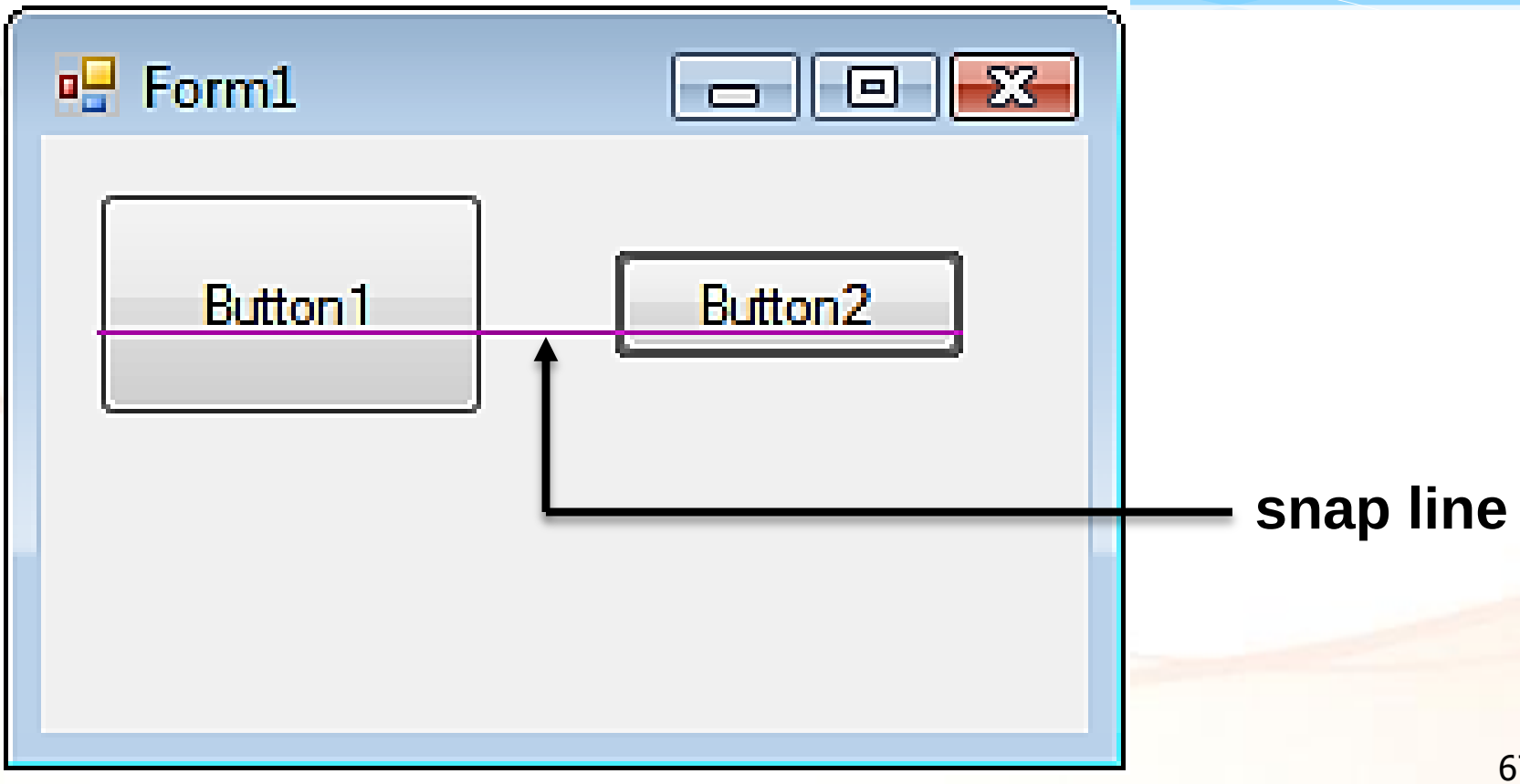
Positioning Controls



Aligning Bottoms of Controls



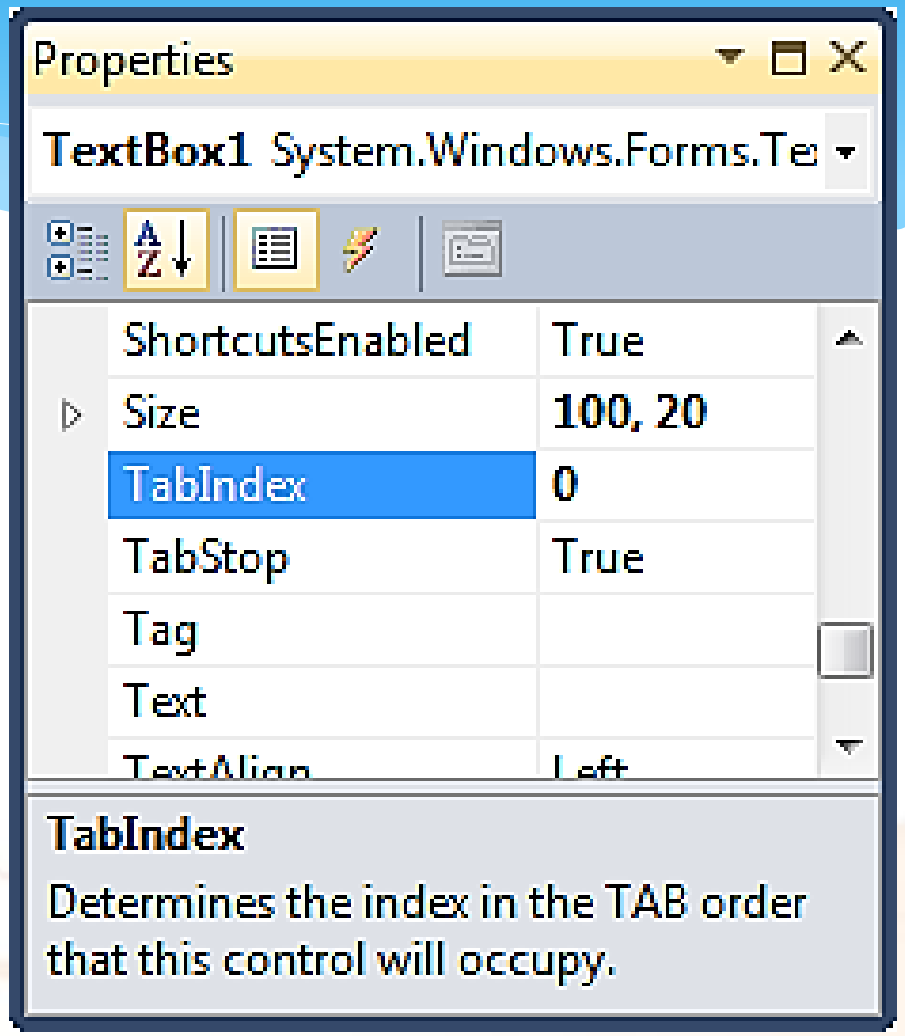
Aligning Middles of Controls



Tab Order

The tab indices determine the order in which controls receive the focus during tabbing.

The control whose TabIndex property is set to 0 has the focus when the program begins.



3 Visual Basic Events

* An Event Procedure Walkthrough
* Properties and Event Procedures of the Form
* The Header of an Event Procedure

Event

* An **event** is an action, such as the user clicking on a button
* Usually, nothing happens in a Visual Basic program until the user does something and raises an event.
* What happens is determined by statements inside the event procedure.

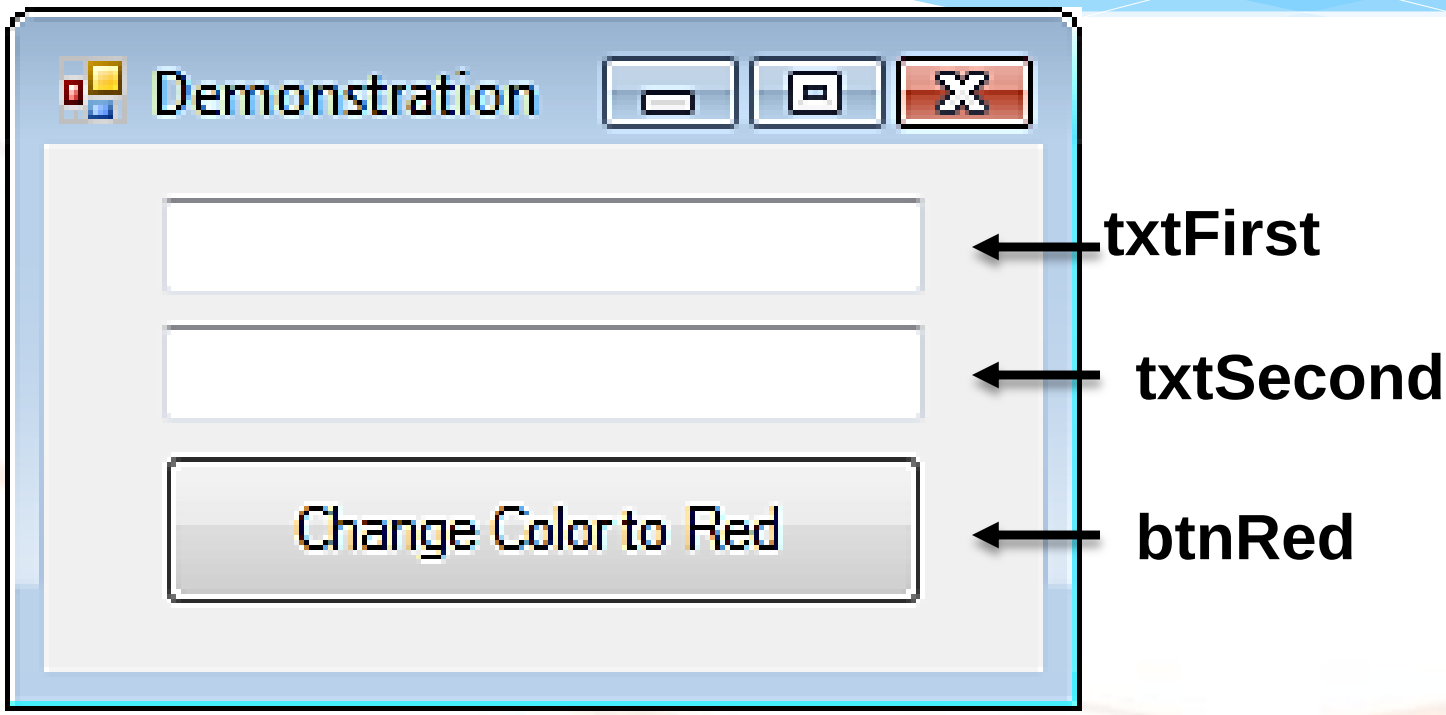
Sample Statements

* txtBox.ForeColor = Color.Red
* txtBox.Visible = True
* txtBox.Text = "Hello World"

General Form:

controlName.property = setting

Sample Form


Demonstration
Change Color to Red
txtFirst
txtSecond
btnRed

Focus

* When you click on a text box, a cursor appears in the text box, and you can type into the text box.
* Such a text box is said to have the **focus**.
* If you click on another text box, the first text box loses the focus and the second text box receives the focus.

Examples of Events

* btnShow.Click
* txtBox.TextChanged
* txtBox.Leave

General Form:

controlName.event

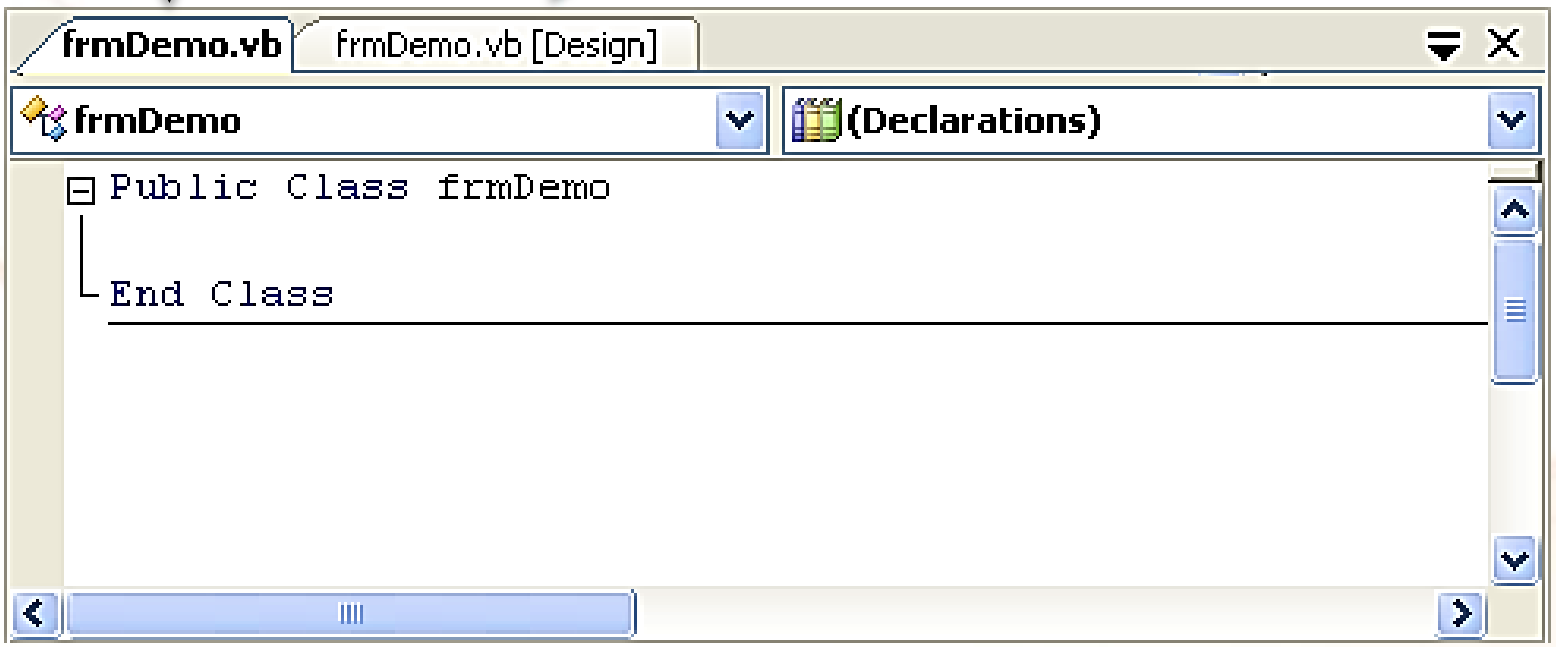
The Three Steps in Creating a Visual Basic Program

1. Create the interface; that is, generate, position, and size the objects.
2. Set properties; that is, configure the appearance of the objects.
3. Write the code that executes when events occur.

Code Editor

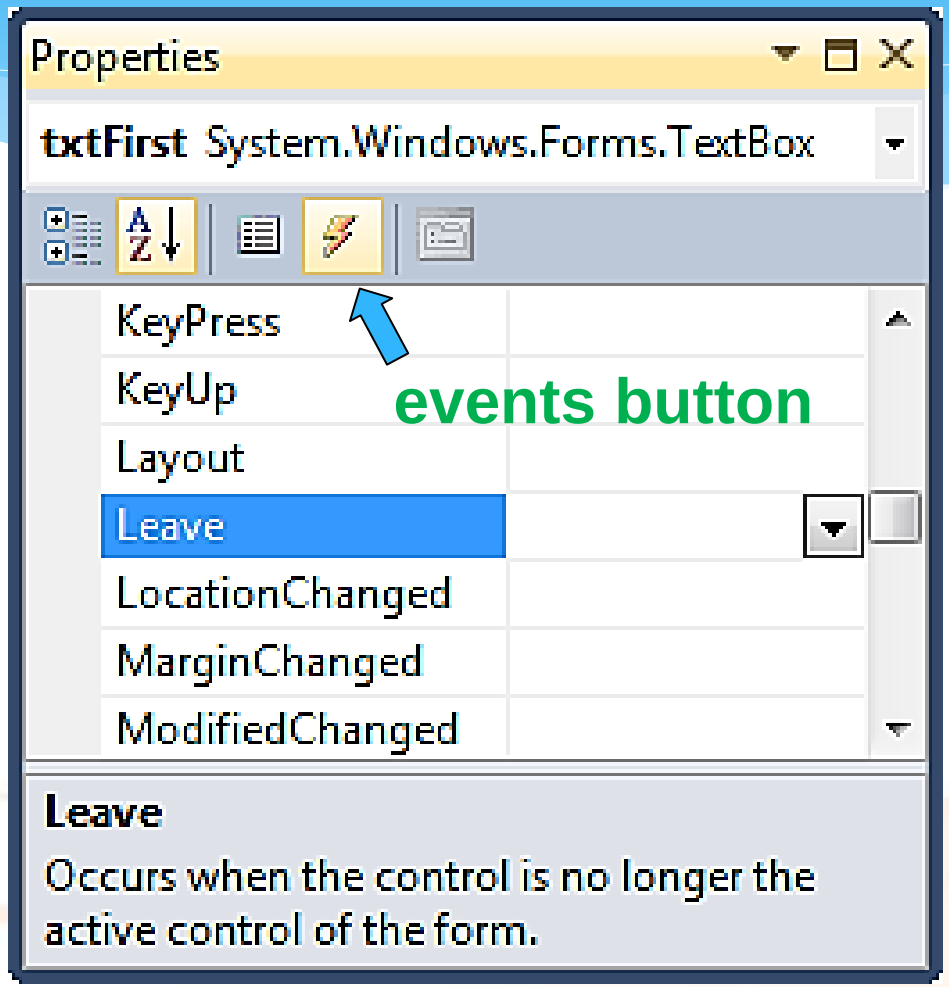
Code Editor tab

Form Designer tab



Display Events for a Control

* Select the control
* Click on the Events button ( ) in the Properties window



Structure of an Event Procedure

header

```
Private Sub objectName_event(...)
                    Handles objectName.event
    statements
End Sub
```

(...) is filled automatically with (ByVal sender As System.Object, ByVal e As System.EventArgs)

Create an Outline for an Event Procedure

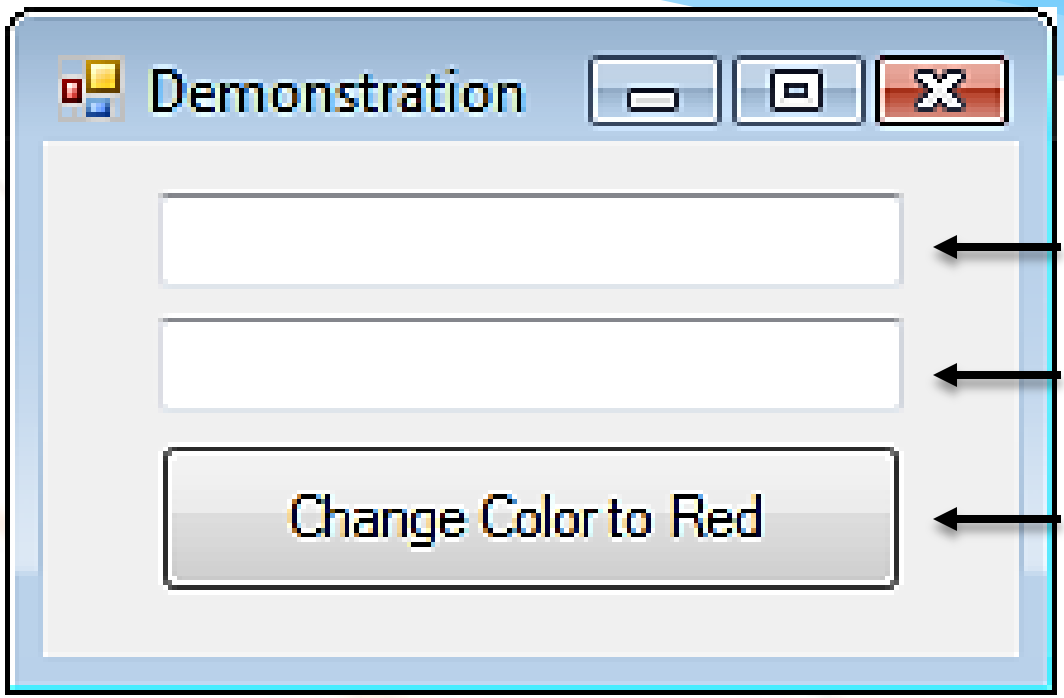
* Double-click on a control

or

* Select a control, click on the Events button in the Properties window, and double-click on an event

(We nearly always use the first method.)

Sample Form



txtFirst

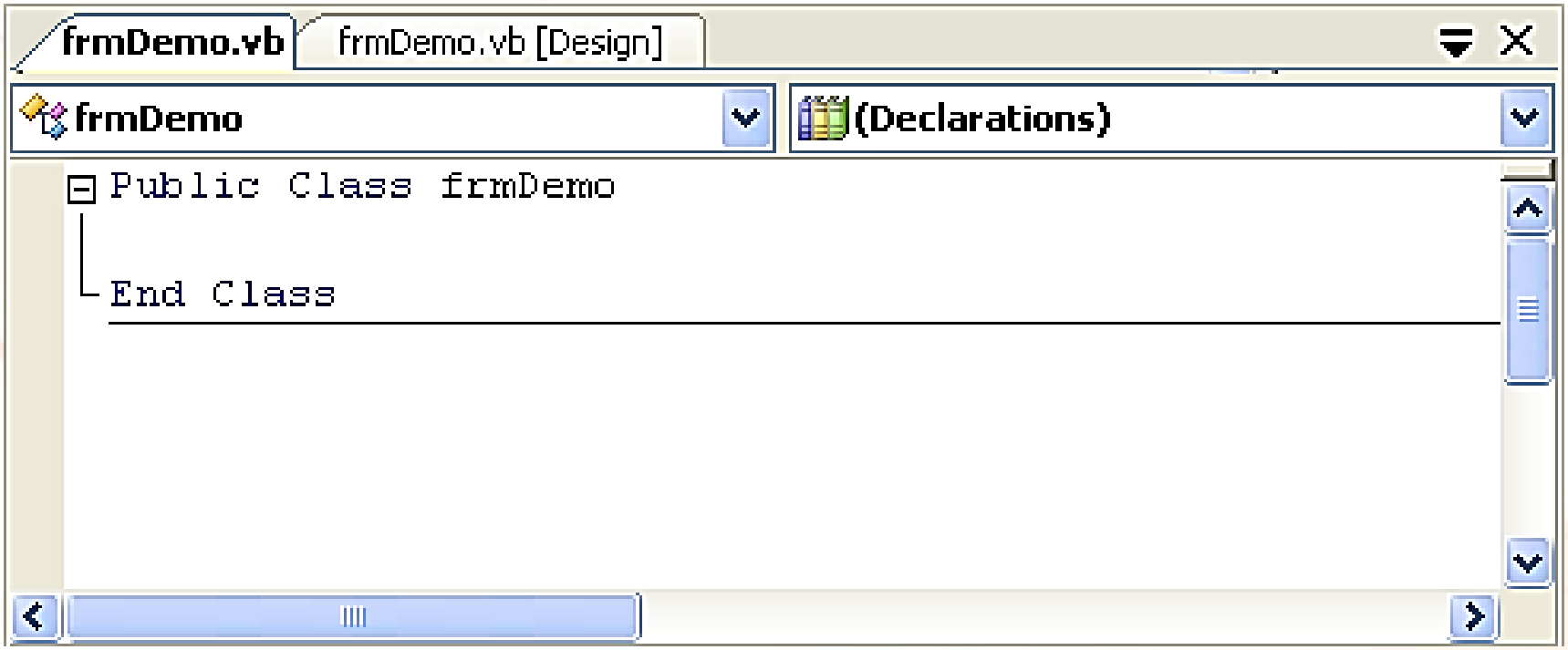
txtSecond

btnRed

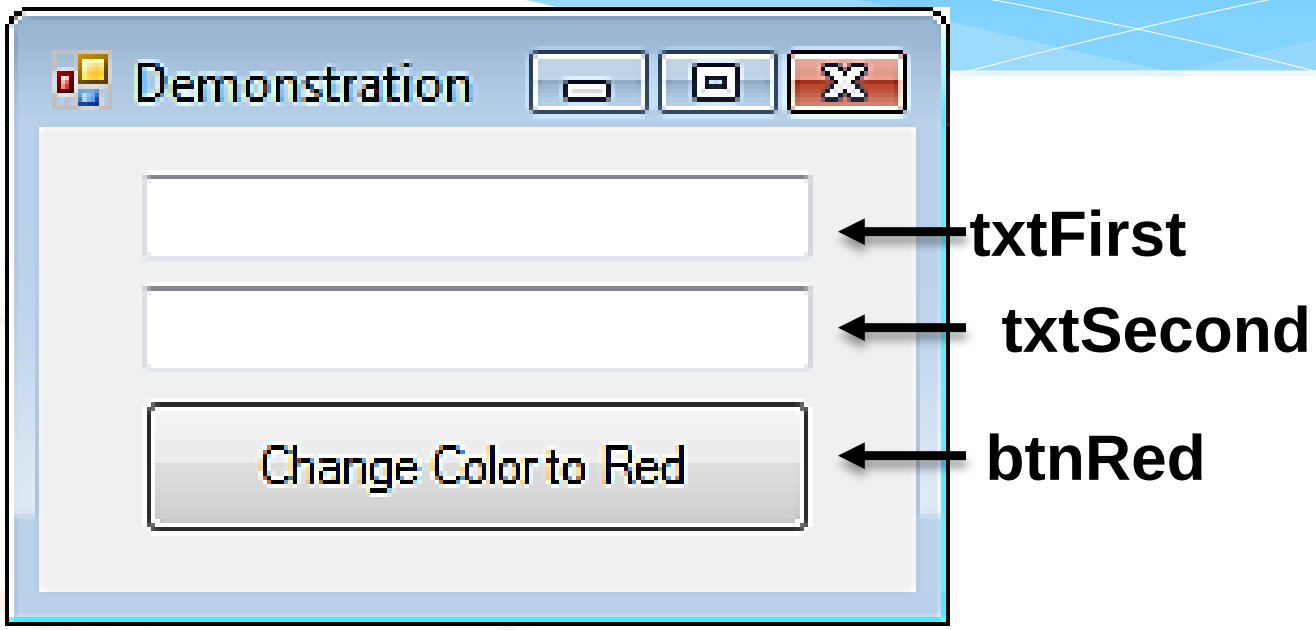
Double-click on txtFirst to create the outline for the Code Editor

Code Editor

click tab to return to Form Designer



Sample Form



Double-click on btnRed to return to Code Editor and add the outline of an event procedure

Header of Event Procedure

```
Private Sub btnRed_Click(…) Handles btnRed.Click
```

Name, can be changed.

Identifies event

```
Private Sub Button_Press(…) Handles btnRed.Click
```

Altering Properties of the Form

* The following won't work:

```
frmDemo.Text = "Demonstration"
```

* The form is referred to by the keyword *Me*.

```
Me.Text = "Demonstration"
```

Open and Run an Existing Program

* Click on *Open Project* in the *File* menu.
* Navigate to the program's folder.
* Double-click on the program's folder to open it.
* Double-click on the file with extension *sln*.
* In the Solution Explorer double-click on the file with extension *vb*. (The Form Designer will appear.)
* Press F5 to run the program.