CHAPTER

1

Introduction to Programming and Visual C# 2005

at the completion of this chapter, you will be able to . . .

1. Describe the process of visual program design and development.
2. Explain the term *object-oriented programming*.
3. Explain the concepts of classes, objects, properties, methods, and events.
4. List and describe the three steps for writing a C# program.
5. Describe the various files that make up a C# project.
6. Identify the elements in the Visual Studio environment.
7. Define *design time*, *run time*, and *debug time*.
8. Write, run, save, print, and modify your first C# program.
9. Identify syntax errors, run-time errors, and logic errors.
10. Look up C# topics in Help.

Writing Windows Applications with Visual C#

Using this text, you will learn to write computer programs that run in the Microsoft Windows environment. Your projects will look and act like standard Windows programs. You will use the tools in C# (C sharp) and Windows Forms to create windows with familiar elements such as labels, text boxes, buttons, radio buttons, check boxes, list boxes, menus, and scroll bars. Figure 1.1 shows some sample Windows user interfaces.

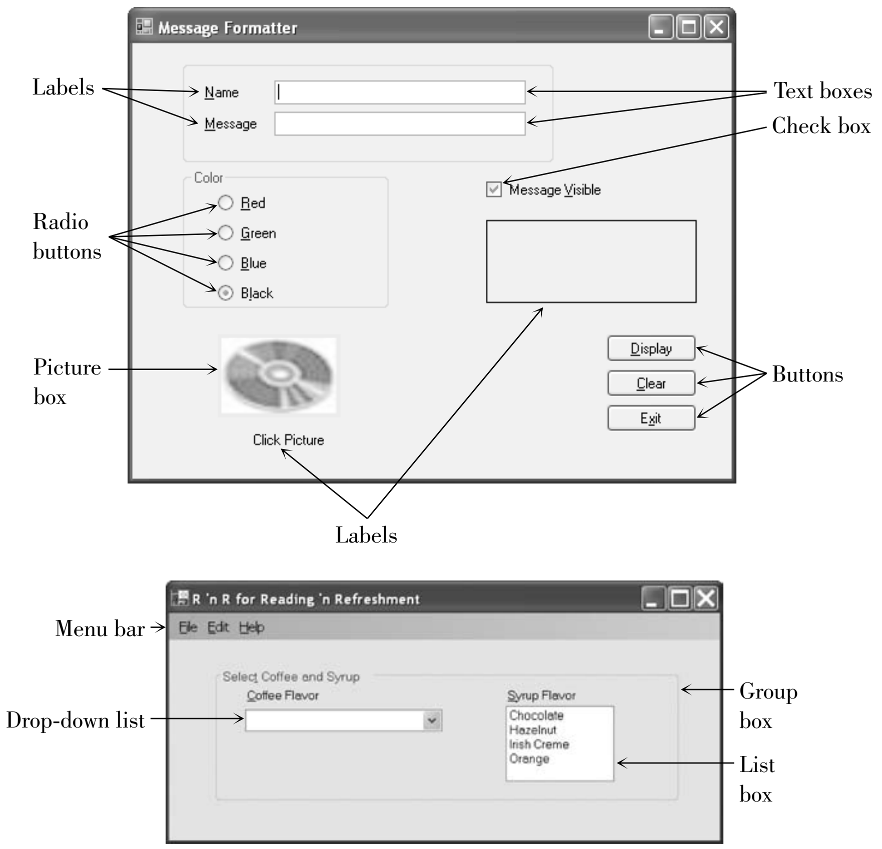


Figure 1.1

Graphical user interfaces for application programs designed with C# and Windows Forms.

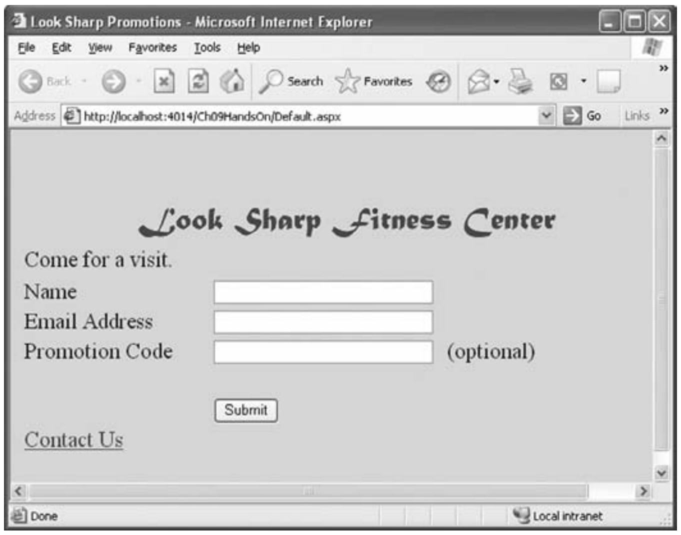
Beginning in Chapter 9 you will create programs using Web Forms and Visual Web Developer. You can run Web applications in a browser such as Internet Explorer, on the Internet, or on a company intranet. Figure 1.2 shows a Web Form application.

The Windows Graphical User Interface

Microsoft Windows uses a **graphical user interface**, or **GUI** (pronounced "gooey"). The Windows GUI defines how the various elements look and function. As a C# programmer, you have available a **toolbox** of these elements. You will create new windows, called ***forms***. Then you will use the

Figure 1.2

A Web Forms application running in a browser.


Look Sharp Promotions - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://localhost:4014/Ch09HandsOn/Default.aspx
Go Links
Done
Local intranet

Look Sharp Fitness Center

Come for a visit.

Name

Email Address

Promotion Code (optional)

Submit

Contact Us

toolbox to add the various elements, called ***controls***. The projects that you will write follow a programming technique called ***object-oriented programming (OOP)***.

Programming Languages—Procedural, Event Driven, and Object Oriented

There are literally hundreds of programming languages. Each was developed to solve a particular type of problem. Most traditional languages, such as BASIC, C, COBOL, FORTRAN, PL/1, and Pascal, are considered *procedural* languages. That is, the program specifies the exact sequence of all operations. Program logic determines the next instruction to execute in response to conditions and user requests.

The newer programming languages such as C#, J#, Java, and Visual Basic (VB) 2005 use a different approach: *object-oriented programming (OOP)*.

In the OOP model, programs are no longer procedural. They do not follow a sequential logic. You, as the programmer, do not take control and determine the sequence of execution. Instead, the user can press keys and click various buttons and boxes in a window. Each user action can cause an event to occur, which triggers a method (a set of programming statements) that you have written. For example, the user clicks on a button labeled Calculate. The clicking causes the button's Click event to occur, and the program automatically jumps to a method you have written to do the calculation.

The Object Model

In C# you will work with objects, which have properties, methods, and events. Each object is based on a class.

Objects

Think of an **object** as a thing, or a noun. Examples of objects are forms and controls. *Forms* are the windows and dialog boxes you place on the screen; *controls* are the components you place inside a form, such as text boxes, buttons, and list boxes.

Properties

Properties tell something about or control the behavior of an object such as its name, color, size, or location. You can think of properties as adjectives that describe objects.

When you refer to a property, you first name the object, add a period, and then name the property. For example, refer to the Text property of a form called SalesForm as SalesForm.Text (pronounced "sales form dot text").

TIP

The term *members* is used to refer to both properties and methods. ■

Methods

Actions associated with objects are called *methods*. **Methods** are the verbs of object-oriented programming. Some typical methods are `Close`, `Show`, and `Clear`. Each of the predefined objects has a set of methods that you can use. You will learn to write additional methods to perform actions in your programs.

You refer to methods as Object.Method ("object dot method"). For example, a `Show` method can apply to different objects: `BillingForm.Show` shows the form object called BillingForm; `exitButton.Show` shows the button object called exitButton.

Events

You can write methods that execute when a particular event occurs. An **event** occurs when the user takes an action such as clicking a button, pressing a key, scrolling, or closing a window. Events also can be triggered by actions of other objects, such as repainting a form or a timer reaching a preset point.

Classes

A **class** is a template or blueprint used to create a new object. Classes contain the definition of all available properties, methods, and events.

Each time that you create a new object, it must be based on a class. For example, you may decide to place three buttons on your form. Each button is based on the Button class and is considered one object, called an *instance* of the class. Each button (or instance) has its own set of properties, methods, and events. One button may be labeled "OK", one "Cancel", and one "Exit". When the user clicks the OK button, that button's Click event occurs; if the user clicks on the Exit button, that button's Click event occurs. And, of course, you have written different program instructions for each of the button's Click events.

An Analogy

If the concepts of classes, objects, properties, methods, and events are still a little unclear, maybe an analogy will help. Consider an Automobile class. When we say *automobile*, we are not referring to a particular auto, but we know that an automobile has a make and model, a color, an engine, and a number of doors. These elements are the *properties* of the Automobile class.

Each individual auto is an object, or an instance of the Automobile class. Each Automobile object has its own settings for the available properties. For example, each object has a Color property, such as myAuto.Color = Blue and yourAuto.Color = Red.

The methods, or actions, of the Automobile class might be `Start`, `SpeedUp`, `SlowDown`, and `Stop`. To refer to the methods of a specific object of the class, use `myAuto.Start` and `yourAuto.Stop`.

The events of an Automobile class could be Arrive or Crash. In a C# program, you write event-handling methods that specify the actions you want to take when a particular event occurs for an object. For example, you might write a method to handle the yourAuto.Crash event.

Note: Chapter 12 presents object-oriented programming in greater depth.

Microsoft's Visual Studio .NET

The latest version of Microsoft's Visual Studio, called Visual Studio 2005, includes C#, Visual C++, Visual Basic, J# (J sharp), and the .NET 2.0 Framework.

The .NET Framework

The programming languages in Visual Studio run in the .NET Framework. The Framework provides for easier development of Web-based and Windows-based applications, allows objects from different languages to operate together, and standardizes how the languages refer to data and objects. Several third-party vendors have announced or released versions of other programming languages to run in the .NET Framework, including .NET versions of APL by Dyalog, FORTRAN by Lahey Computer Systems, COBOL by Fujitsu Software Corporation, Pascal by the Queensland University of Technology (free), PERL by ActiveState, RPG by ASNA, and Java, known as IKVM.NET. See http://www.gotdotnet.com/team/lang/ for the latest details.

The .NET languages all compile to (are translated to) a common machine language, called Microsoft Intermediate Language (MSIL). The MSIL code, called *managed code,* runs in the Common Language Runtime (CLR), which is part of the .NET Framework.

C#

Microsoft C# comes with Visual Studio. You also can purchase C# by itself (without the other languages but *with* the .NET Framework). C# is available in an **Express Edition**, a **Standard Edition,** a **Professional Edition**, and a **Team System** (see http://msdn.microsoft.com/vstudio/products/compare/). Anyone planning to do professional application development that includes the advanced features of database management should use the Professional Edition or the Team System version. The trial version packaged with this book is the 180-day trial version of the Professional Edition. The full Professional Edition is available to educational institutions through the Microsoft Academic Alliance program and is the best possible deal. When a campus department purchases the Academic Alliance, the school can install Visual Studio on all classroom and lab computers and provide the software to all students and faculty at no additional charge.

This text is based on C# 2005, the current version. You cannot run the projects in this text in any earlier version of C#.

Writing C# Programs

When you write a C# application, you follow a three-step process for planning the project and then repeat the process for creating the project. The three steps involve setting up the user interface, defining the properties, and then creating the code.

The Three-Step Process

Planning

1. *Design the user interface*. When you plan the **user interface**, you draw a sketch of the screens the user will see when running your project. On your sketch, show the forms and all the controls that you plan to use. Indicate the names that you plan to give the form and each of the objects on the form. Refer to Figure 1.1 for examples of user interfaces.

   Before you proceed with any more steps, consult with your user and make sure that you both agree on the look and feel of the project.
2. *Plan the properties*. For each object, write down the properties that you plan to set or change during the design of the form.
3. *Plan the C# code*. In this step you plan the classes and methods that will execute when your project runs. You will determine which events require action to be taken and then make a step-by-step plan for those actions.

   Later, when you actually write the C# **code**, you must follow the language syntax rules. But during the planning stage, you will write out the actions using **pseudocode**, which is an English expression or comment that describes the action. For example, you must plan for the event that occurs when the user clicks on the Exit button. The pseudocode for the event could be *End the project* or *Quit*.

Programming

After you have completed the planning steps and have approval from your user, you are ready to begin the actual construction of the project. Use the same three-step process that you used for planning.

1. *Define the user interface*. When you define the user interface, you create the forms and controls that you designed in the planning stage.

   Think of this step as defining the objects you will use in your application.
2. *Set the properties*. When you set the properties of the objects, you give each object a name and define such attributes as the contents of a label, the size of the text, and the words that appear on top of a button and in the form's title bar.

   You might think of this step as describing each object.
3. *Write the code*. You will use C# programming statements (called *C# code*) to carry out the actions needed by your program. You will be surprised and pleased by how few statements you need to create a powerful Windows program.

   You can think of this third step as defining the actions of your program.

C# Application Files

A C# application, called a ***solution***, can consist of one or more projects. Since all of the solutions in this text have only one project, you can think of one solution = one project. Each project can contain one or more form files. In Chapters 1 through 5, all projects have only one form, so you can think of one project = one form. Starting in Chapter 6, your projects will contain multiple forms and additional files. As an example, the HelloWorld application that you will create later in this chapter creates the following files:

HelloWorld.sln	The **solution file**. A text file that holds information about the solution and the projects it contains. This is the primary file for the solution—the one that you open to work on or run your project.
HelloWorld.suo	Solution user options file. Stores information about the state of the IDE, so that all customizations can be restored each time you open the solution.
HelloForm.cs	A .cs (C#) file. Holds the code methods that you write for a form. This is a text file that you can open in any editor. *Warning*: You should not modify this file unless you are using the editor in the Visual Studio environment.
HelloForm.Designer.cs	A .cs (C#) file. Holds the definition of the form and its controls. You should not modify the statements in this designer-generated code file, but instead make any desired changes using the form designer.
HelloForm.resx	A resource file for the form. This text file defines all resources used by the form, including strings of text, numbers, and any graphics.
HelloWorld.csproj	A **project file**. A text file that describes the project and lists the files that are included in the project.
Program.cs	A .cs (C#) file. Contains automatically generated code that runs first when you execute your application.

Note: You can display file extensions using My Computer. In the My Computer *Tools* menu, select *Folder Options* and the *View* tab. Deselect the check box for *Hide extensions for known file types.*

After you run your project, you will find several more files created by the system. The only file that you open directly is the .sln, or solution file.

The Visual Studio Environment

The **Visual Studio environment** is where you create and test your projects. A development environment such as Visual Studio is called an ***integrated development environment*** (**IDE**). The IDE consists of various tools, including a form designer, which allows you to visually create a form; an editor, for entering and modifying program code; a compiler, for translating the C# statements into the intermediate machine code; a debugger, to help locate and correct program errors; an object browser, to view the available classes, objects, properties, methods, and events; and a Help facility.

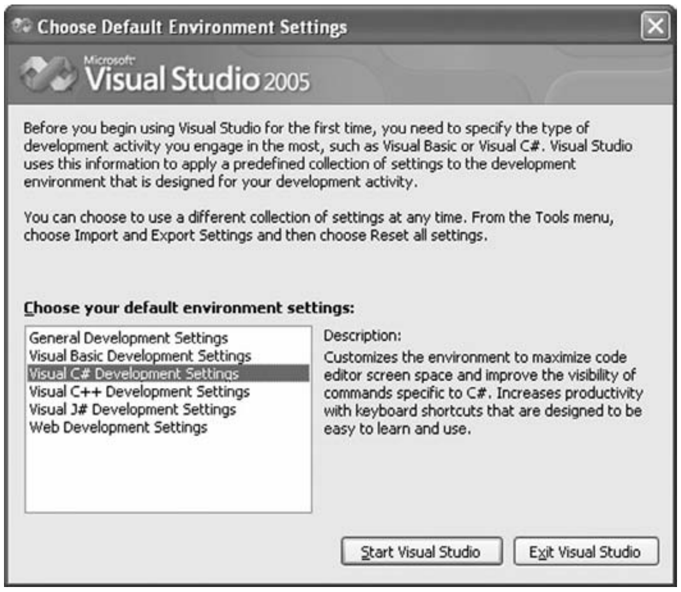
In versions of Visual Studio prior to .NET, each language had its own IDE. For example, to create a Visual Basic project you would use the Visual Basic IDE and to create a C++ project you would use the C++ IDE. But in Visual Studio, you use the one IDE to create projects in any of the supported languages.

Default Environment Settings

Visual Studio 2005 provides a new option that allows the programmer to select the default profile for the IDE. The first time you open Visual Studio, you are presented with the *Choose Default Environment Settings* dialog box (Figure 1.3), where you can choose *Visual C# Development Settings.* This text uses the Visual C# settings.

Figure 1.3

The first time you open the Visual Studio IDE, you must select the default environment settings for Visual C# development.


Choose Default Environment Settings
Microsoft Visual Studio 2005

Before you begin using Visual Studio for the first time, you need to specify the type of development activity you engage in the most, such as Visual Basic or Visual C#. Visual Studio uses this information to apply a predefined collection of settings to the development environment that is designed for your development activity.

You can choose to use a different collection of settings at any time. From the Tools menu, choose Import and Export Settings and then choose Reset all settings.

Choose your default environment settings:

General Development Settings
Visual Basic Development Settings
Visual C# Development Settings
Visual C++ Development Settings
Visual J# Development Settings
Web Development Settings

Description:
Customizes the environment to maximize code editor screen space and improve the visibility of commands specific to C#. Increases productivity with keyboard shortcuts that are designed to be easy to learn and use.

Note: If you plan to develop in more than one language, such as VB and C#, you can save each group of settings and switch back and forth between the two. Select *Tools / Import and Export Settings* and choose to *Reset all settings.*

The IDE Initial Screen

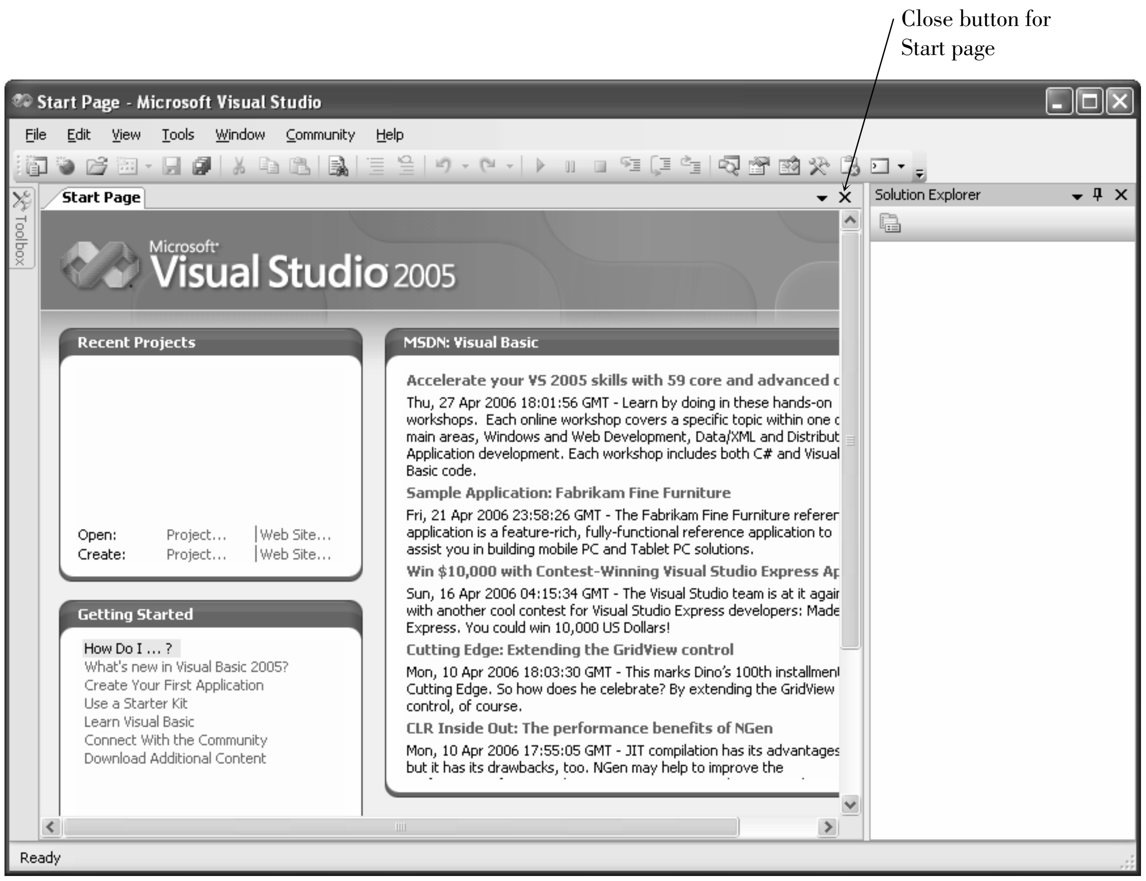
When you open the Visual Studio IDE, you generally see an empty environment with a Start Page (Figure 1.4). However, it's easy to customize the environment, so you may see a different view. In the step-by-step exercise later in this chapter, you will learn to reset the IDE layout to its default view.

The contents of the Start Page vary, depending on whether you are connected to the Internet. Microsoft has included links that can be updated, so you may find new and interesting information on the Start Page each time you open it. To display or hide the Start Page, select *View /Other Windows / Start Page.*

You can open an existing project or begin a new project using the Start Page or the *File* menu. The examples in this text use the menus.

Figure 1.4

The Visual Studio IDE with the Start Page open, as it first appears in Windows XP, without an open project. You can close the Start Page by clicking on its Close button.


Close button for Start page
Start Page - Microsoft Visual Studio
File Edit View Tools Window Community Help
Toolbox
Start Page
Solution Explorer
Microsoft Visual Studio 2005
Recent Projects
Open: Project... | Web Site...
Create: Project... | Web Site...
Getting Started
How Do I ... ?
What's new in Visual Basic 2005?
Create Your First Application
Use a Starter Kit
Learn Visual Basic
Connect With the Community
Download Additional Content
MSDN: Visual Basic
Ready

Accelerate your VS 2005 skills with 59 core and advanced c
Thu, 27 Apr 2006 18:01:56 GMT - Learn by doing in these hands-on workshops. Each online workshop covers a specific topic within one c main areas, Windows and Web Development, Data/XML and Distribut Application development. Each workshop includes both C# and Visual Basic code.

Sample Application: Fabrikam Fine Furniture
Fri, 21 Apr 2006 23:58:26 GMT - The Fabrikam Fine Furniture referer application is a feature-rich, fully-functional reference application to assist you in building mobile PC and Tablet PC solutions.

Win $10,000 with Contest-Winning Visual Studio Express Ap
Sun, 16 Apr 2006 04:15:34 GMT - The Visual Studio team is at it agair with another cool contest for Visual Studio Express developers: Made Express. You could win 10,000 US Dollars!

Cutting Edge: Extending the GridView control
Mon, 10 Apr 2006 18:03:30 GMT - This marks Dino's 100th installment Cutting Edge. So how does he celebrate? By extending the GridView control, of course.

CLR Inside Out: The performance benefits of NGen
Mon, 10 Apr 2006 17:55:05 GMT - JIT compilation has its advantages but it has its drawbacks, too. NGen may help to improve the

The New Project Dialog

You will create your first C# projects by selecting *File / New Project*, which opens the *New Project* dialog (Figure 1.5). In the *New Project* dialog, you may need to expand the node for *Other Languages*, depending on your installation. Under *Visual C#*, select *Windows*, and in the *Templates* pane, select *Windows Application*. You also give the project a name in this dialog. (Note that the project is saved in a temporary location at this time; you do not supply the path. Later, when you choose to save the project, you choose the location.)

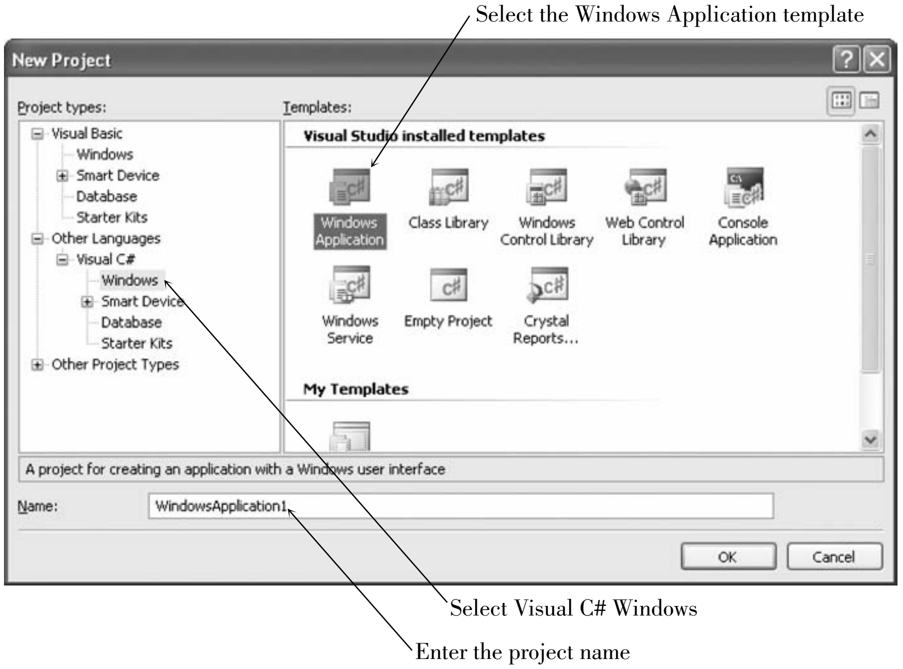
The IDE Main Window

Figure 1.6 shows the Visual Studio environment's main window and its various child windows. Note that each window can be moved, resized, opened, closed, and customized. Some windows have tabs that allow you to display different contents. Your screen may not look exactly like Figure 1.6; in all likelihood, you will want to customize the placement of the various windows.

The windows in the IDE are considered either document windows or tool windows. The tool windows are listed under the *View* menu; document windows

Figure 1.5

Begin a new C# Windows project using the Windows Application template.

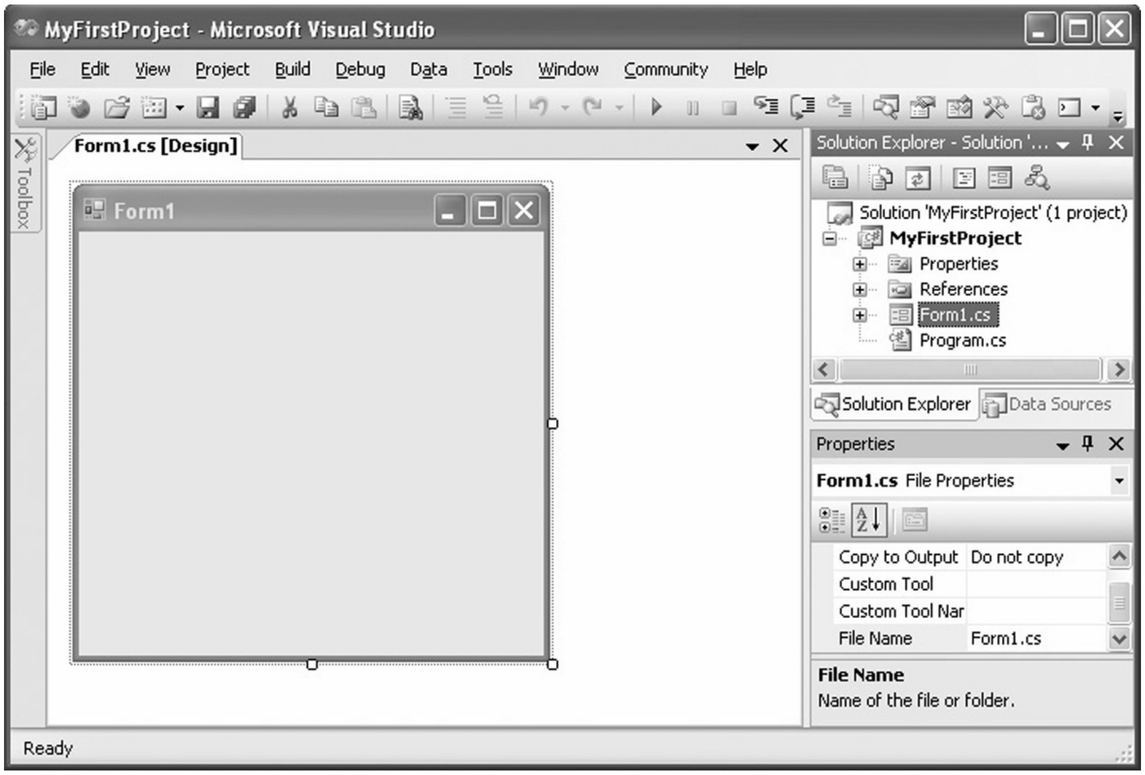


A project for creating an application with a Windows user interface

Name: WindowsApplication1

Figure 1.6

The Visual Studio environment. Each window can be moved, resized, closed, or customized.



Form1.cs File Properties

Copy to Output	Do not copy
Custom Tool	
Custom Tool Nar	
File Name	Form1.cs

File Name
Name of the file or folder.

are generally docked together in the center of the IDE, but the locations and the docking behavior are all customizable.

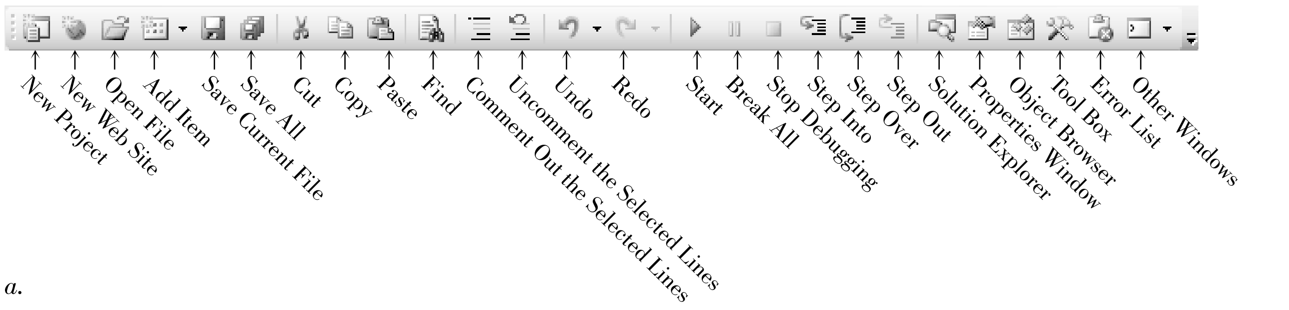
The IDE main window holds the Visual Studio menu bar and the toolbars.

The Toolbars

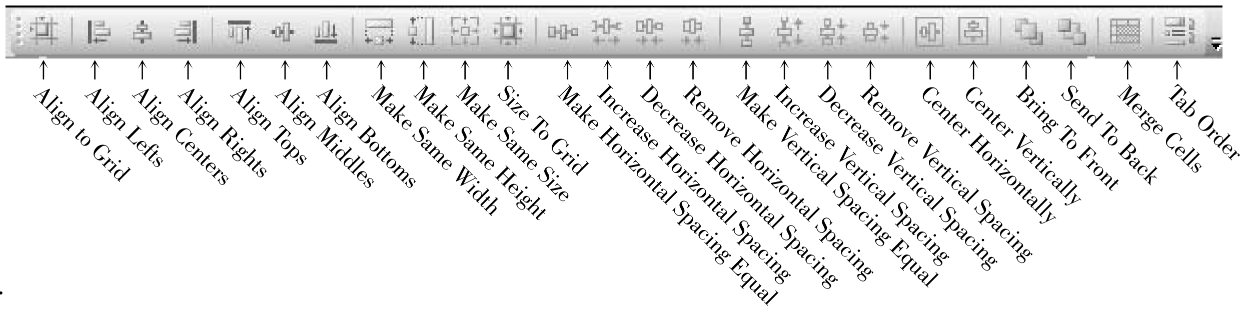
You can use the buttons on the **toolbars** as shortcuts for frequently used operations. Each button represents a command that also can be selected from a menu. Figure 1.7*a* shows the toolbar buttons on the Standard toolbar, which displays in the main window of the IDE; Figure 1.7*b* shows the Layout toolbar, which displays in the Form Designer; and Figure 1.7*c* shows the Text Editor toolbar, which appears when the Editor window is displayed. Select *View / Toolbars* to display or hide these and other toolbars.

Figure 1.7

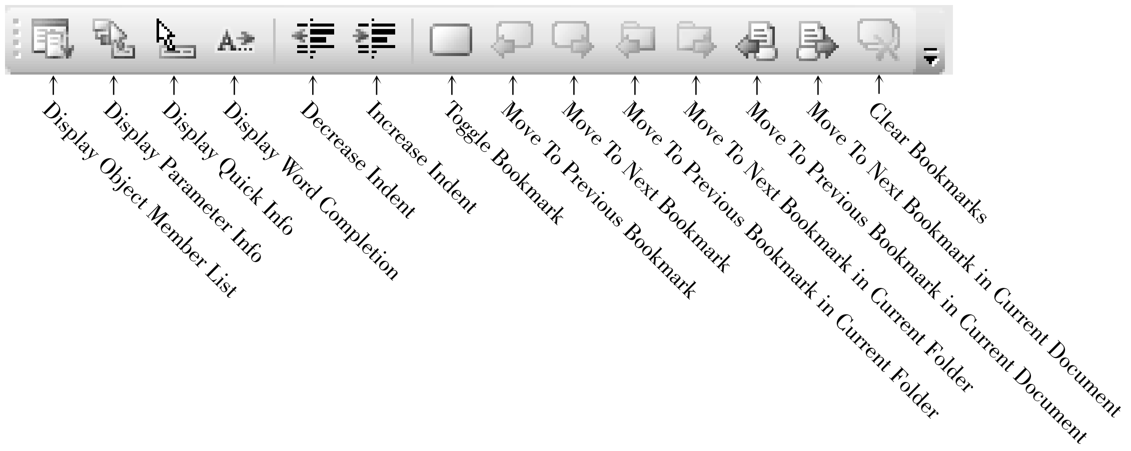
The Visual Studio toolbars contain buttons that are shortcuts for menu commands. You can display or hide each of the toolbars: a. the Standard toolbar; b. the Layout toolbar; and c. the Text Editor toolbar.



a.



b.


Display Object Member List
Display Parameter Info
Display Quick Info
Display Word Completion
Decrease Indent
Increase Indent
Toggle Bookmark
Move To Previous Bookmark
Move To Next Bookmark
Move To Previous Bookmark in Current Folder
Move To Next Bookmark in Current Folder
Move To Previous Bookmark in Current Document
Move To Next Bookmark in Current Document
Clear Bookmarks

c.

The Document Window

The largest window in the center of the screen is the **Document window**. Notice the tabs across the top of the window, which allow you to switch between open documents. The items that display in the Document window include the Form Designer, the Code Editor, the Project Designer, and the Object Browser.

You can switch from one tab to another, or close any of the documents using its Close button.

TIP

Use Ctrl + Tab to cycle through the open documents in the Document window. ■

The Form Designer

The **Form Designer** is where you design a form that makes up your user interface. In Figure 1.6, the Form Designer for Form1 is currently displaying. You can drag the form's sizing handles or selection border to change the size of the form.

When you begin a new C# Windows project, a new form is added to the project with the default name Form1. In the step-by-step exercise later in the chapter, you will learn to change the form's name.

The Solution Explorer Window

The **Solution Explorer window** holds the filenames for the files included in your project and a list of the classes it references. The Solution Explorer window and the environment's title bar hold the name of your solution (.sln) file, which is WindowsApplication1 by default unless you give it a new value in the *New Project* dialog box. In Figure 1.6, the name of the solution is MyFirstProject.

The Properties Window

You use the **Properties window** to set the properties for the objects in your project. See "Set Properties" later in this chapter for instructions on changing properties.

TIP

You can sort the properties in the window either alphabetically or by categories. Use the buttons on the Properties window. ■

The Toolbox

The **toolbox** holds the tools you use to place controls on a form. You may have more or different tools in your toolbox, depending on the edition of C# you are using (Express, Standard, Professional, or Team System). Figure 1.8 shows the toolbox.

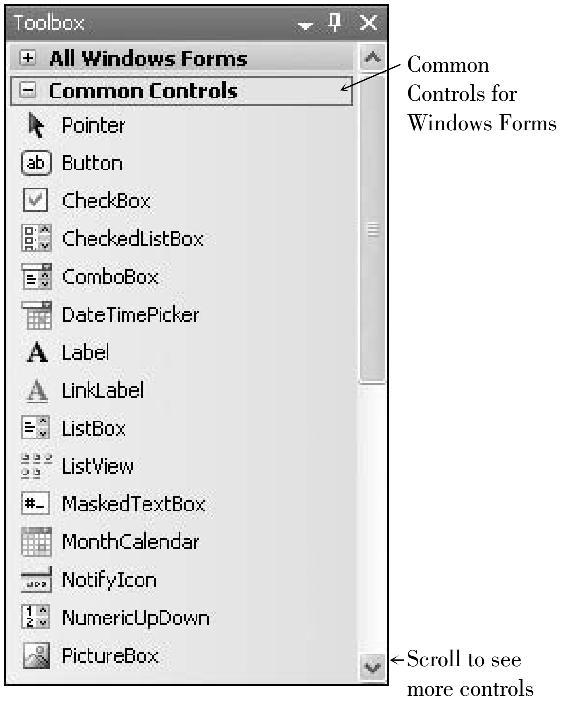
Help

Visual Studio has an extensive **Help** feature that is greatly expanded for the 2005 version. Help includes the Microsoft Developer Network library (MSDN), which contains reference materials for C#, C++, VB, and Visual Studio; several books; technical articles; and the Microsoft Knowledge Base, a database of frequently asked questions and their answers.

Help includes the entire reference manual, as well as many coding examples. See the topic "Visual Studio Help" later in this chapter for help on Help.

When you make a selection from the *Help* menu, the requested item appears in a new window that floats on top of the IDE window (Figure 1.9), so you can keep both open at the same time. It's a good idea to set the *Filtered By* entry to *Visual C#*.

Figure 1.8



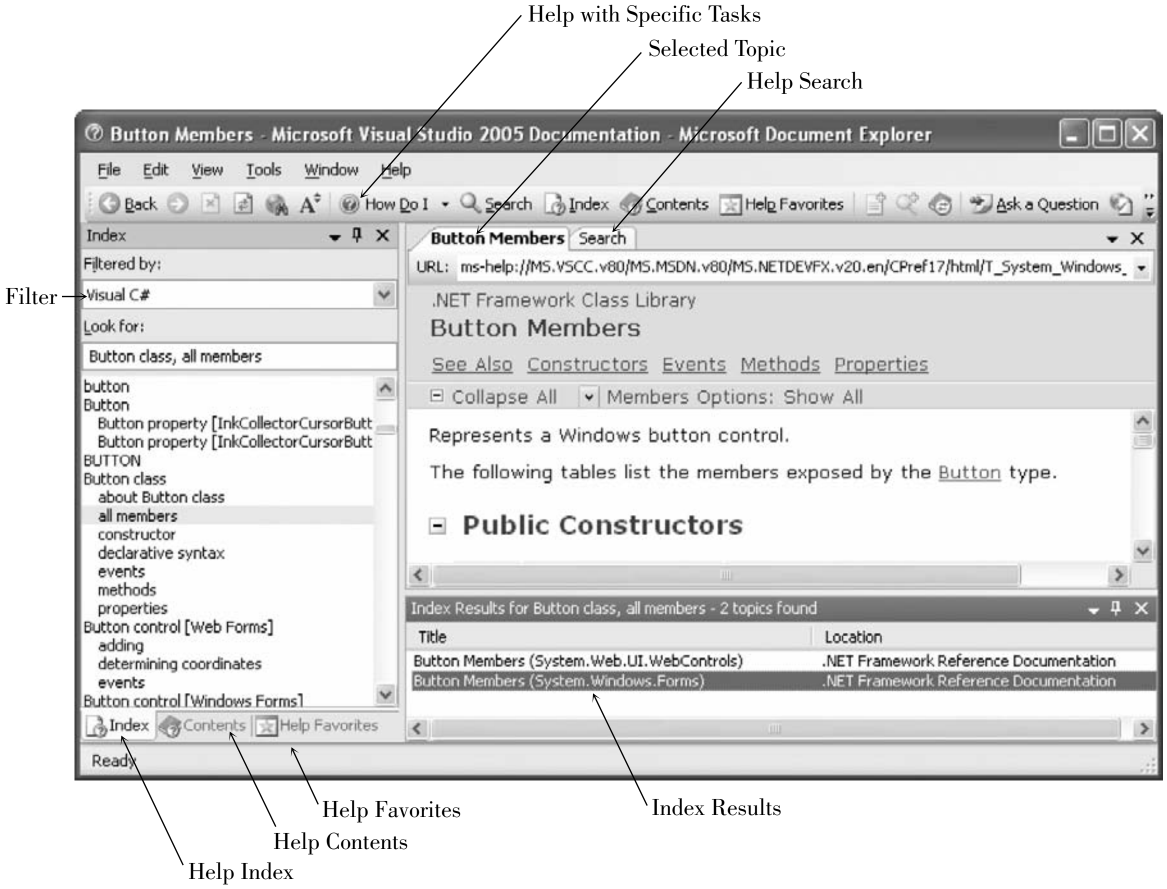
The toolbox for Visual Studio Windows Forms. Your toolbox may have more or fewer tools, depending on the edition you are using.

TIP

You can sort the tools in the toolbox: Right-click the toolbox and select *Sort Items Alphabetically* from the context menu (the shortcut menu). ■

Figure 1.9

Help displays in a new window, independent of the Visual Studio IDE window.


Help with Specific Tasks
Selected Topic
Help Search
Button Members - Microsoft Visual Studio 2005 Documentation - Microsoft Document Explorer
File Edit View Tools Window Help
Back How Do I Search Index Contents Help Favorites Ask a Question
Index
Filtered by:
Visual C#
Look for:
Button class, all members
button
Button
Button property [InkCollectorCursorButt
Button property [InkCollectorCursorButt
BUTTON
Button class
about Button class
all members
constructor
declarative syntax
events
methods
properties
Button control [Web Forms]
adding
determining coordinates
events
Button control [Windows Forms]
Index Contents Help Favorites
Ready
Button Members Search
URL: ms-help://MS.VSCC.v80/MS.MSDN.v80/MS.NETDEVFX.v20.en/CPref17/html/T_System_Windows_
.NET Framework Class Library
Button Members
See Also Constructors Events Methods Properties
Collapse All Members Options: Show All
Public Constructors
Index Results for Button class, all members - 2 topics found
Filter
Help Favorites
Help Contents
Help Index
Index Results

Represents a Windows button control.

The following tables list the members exposed by the Button type.

Title	Location
Button Members (System.Web.UI.WebControls)	.NET Framework Reference Documentation
Button Members (System.Windows.Forms)	.NET Framework Reference Documentation

Design Time, Run Time, and Debug Time

C# has three distinct modes. While you are designing the user interface and writing code, you are in **design time**. When you are testing and running your project, you are in **run time**. If you get a run-time error or pause project execution, you are in **debug time**. The IDE window title bar indicates (Running) or (Debugging) to indicate that a project is no longer in design time.

Writing Your First C# Project

For your first C# project, you will create a form with three controls (see Figure 1.10). This simple project will display the message "Hello World" in a label when the user clicks the Display button and will terminate when the user clicks the Exit button.

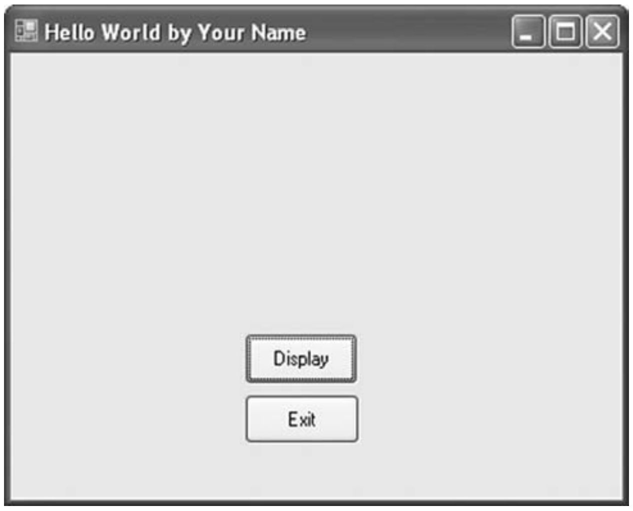


Figure 1.10

The Hello World form. The "Hello World" message will appear in a label when the user clicks on the Display button. The label does not appear until the button is pressed.

Set Up Your Workspace

Before you can begin a project, you must open the Visual Studio IDE. You also may need to customize your workspace.

Run Visual Studio

These instructions assume that Visual Studio 2005 is installed in the default location. If you are running in a classroom or lab, the program may be installed in an alternate location, such as directly on the desktop.

STEP 1: Click the Windows *Start* button and move the mouse pointer to *All Programs.*

STEP 2: Locate *Microsoft Visual Studio 2005.*

STEP 3: In the submenu that pops up, select *Microsoft Visual Studio 2005.*

Visual Studio will start and display the Start Page (refer to Figure 1.4).

Note: The VS IDE can be customized to not show the Start Page when it opens.

Start a New Project

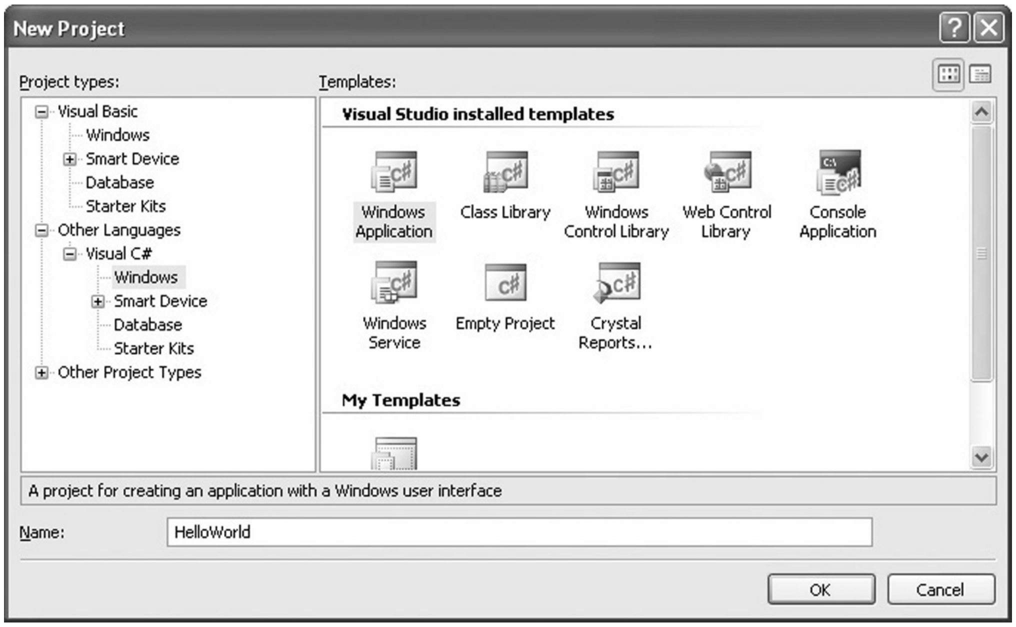
STEP 1: Select *File / New Project*; the *New Project* dialog box opens (refer to Figure 1.5). Make sure that *Visual C#* and *Windows* are selected for *Project types* and *Windows Application* is selected for the template. If you are using Visual C# Express, the dialog box differs slightly, but you can still choose a Windows Application.

STEP 2: Enter "HelloWorld" (without the quotes) for the name of the new project (Figure 1.11) and click the *OK* button. The new project opens (Figure 1.12). At this point, your project is stored in a temporary directory. You specify the location for the project later when you save it.

Note: Your screen may look significantly different from the figure since the environment can be customized.

Figure 1.11

Enter the name for the new project.



New Project

Project types:
- Visual Basic
  - Windows
  - Smart Device
  - Database
  - Starter Kits
- Other Languages
  - Visual C#
    - Windows
    - Smart Device
    - Database
    - Starter Kits
- Other Project Types

Templates:

Visual Studio installed templates

Windows Application, Class Library, Windows Control Library, Web Control Library, Console Application, Windows Service, Empty Project, Crystal Reports...

My Templates

A project for creating an application with a Windows user interface

Name: HelloWorld

Set Up Your Environment

In this section, you will customize the environment. For more information on customizing windows, floating and docking windows, and altering the location and contents of the various windows, see Appendix C.

STEP 1: Reset the IDE's default layout by choosing *Window / Reset Window Layout* and responding *Yes*. The IDE should now match Figure 1.12.

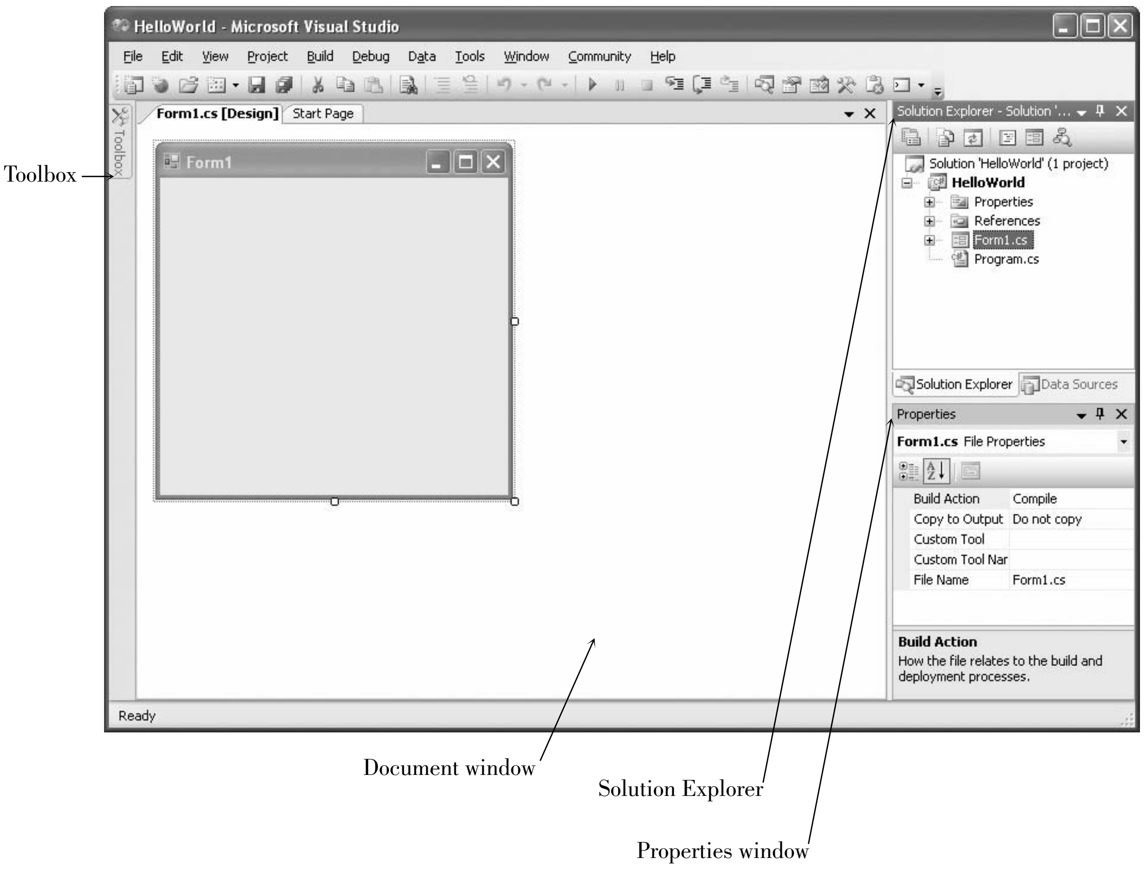
Note: If the Data Sources window appears on top of the Solution Explorer window, click on the Solution Explorer tab to make it appear on top.

STEP 2: Point to the icon for the toolbox at the left of the IDE window. The Toolbox window pops open. Notice the pushpin icon at the top of the window (Figure 1.13); clicking this icon makes the window remain on the screen rather than Auto Hide.

STEP 3: Click the Auto Hide pushpin icon for the Toolbox window; the toolbox will remain open.

Figure 1.12

The Visual Studio IDE with the new HelloWorld C# project.

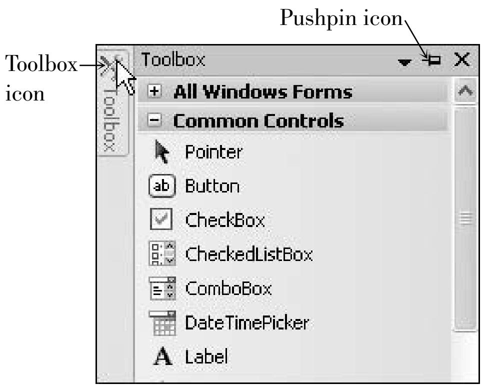


Build Action	Compile
Copy to Output	Do not copy
Custom Tool	
Custom Tool Nar	
File Name	Form1.cs

Build Action
How the file relates to the build and deployment processes.

Figure 1.13

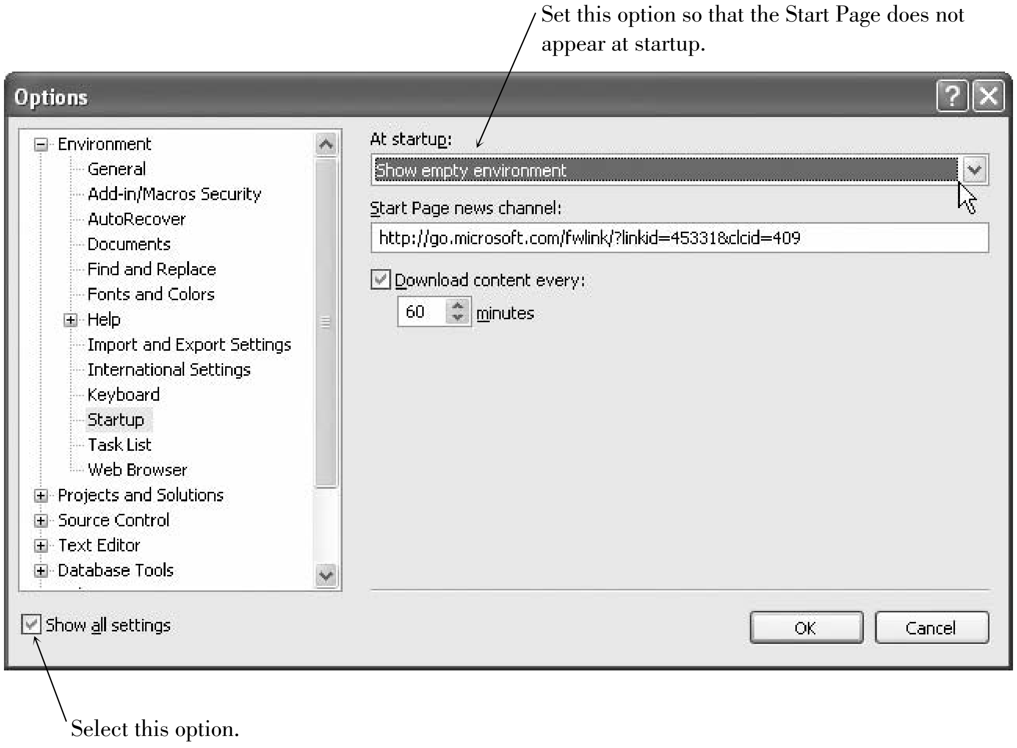
The Toolbox window.



STEP 4: Optional: Select *Tools / Options*. In the *Options* dialog box, make sure that *Show all settings* is selected, select *Startup* under *Environment*, drop down the *At startup* list and select *Show empty environment* (Figure 1.14), and click *OK*. This selection causes the Start Page to not appear and will make your environment match the illustrations in this text. Note that you can show the Start Page at any time by selecting *View / Start Page*.

Figure 1.14

Select Show empty environment for the environment's startup option in the Options dialog box.



At startup: Show empty environment

Start Page news channel: http://go.microsoft.com/fwlink/?linkid=45331&clcid=409

✓ Download content every: 60 minutes

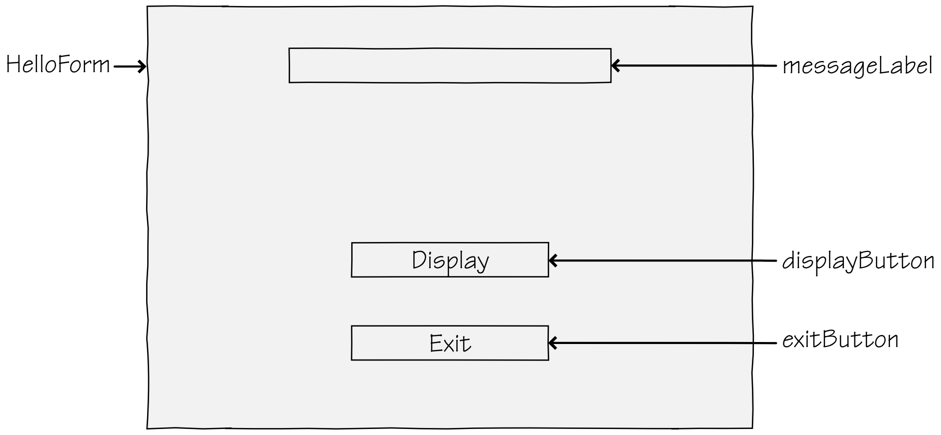
✓ Show all settings

Plan the Project

The first step in planning is to design the user interface. Figure 1.15 shows a sketch of the form that includes a label and two buttons. You will refer to the sketch as you create the project.

Figure 1.15

A sketch of the Hello World form for planning.



The next two steps, planning the properties and the code, have already been done for this first sample project. You will be given the values in the steps that follow.

Define the User Interface

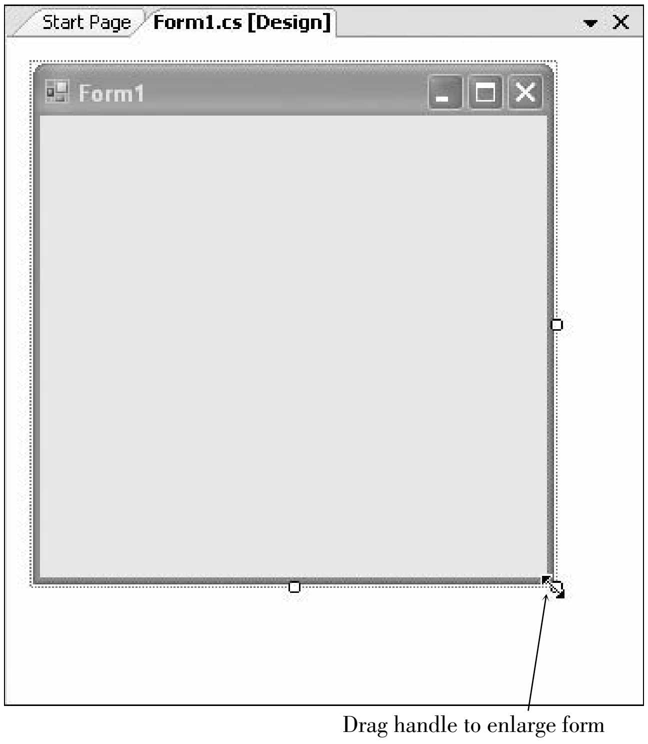
Set Up the Form

Notice that the new form in the Document window has all the standard Windows features, such as a title bar, maximize and minimize buttons, and a close button.

STEP 1: Resize the form in the Document window: Drag the handle in the lower-right corner down and to the right (Figure 1.16).

Figure 1.16

Make the form larger by dragging its lower-right handle diagonally. The handles disappear as you drag the corner of the form.



Place Controls on the Form

You are going to place three controls on the form: a **Label** and two **Buttons**.

STEP 1: Point to the Label tool in the toolbox and double-click; a Label control appears on the form. Move the label to the desired location (Figure 1.17). Later you will adjust the label's size.

As long as the label is selected, you can press the Delete key to delete it, or drag it to a new location.

You can tell that a label is selected; it has a black border, as shown in Figure 1.17, when the AutoSize property is *true* (the default) or sizing handles if you set the AutoSize property to *false*.

STEP 2: Draw a button on the form: Click on the Button tool in the toolbox, position the crosshair pointer for one corner of the button, and drag to the diagonally opposite corner (Figure 1.18). When you release the mouse button, the new button should appear selected and have

Figure 1.17

The newly created label appears outlined, indicating that it is selected. Notice that the contents of the label are set to the control's name (label1) by default.

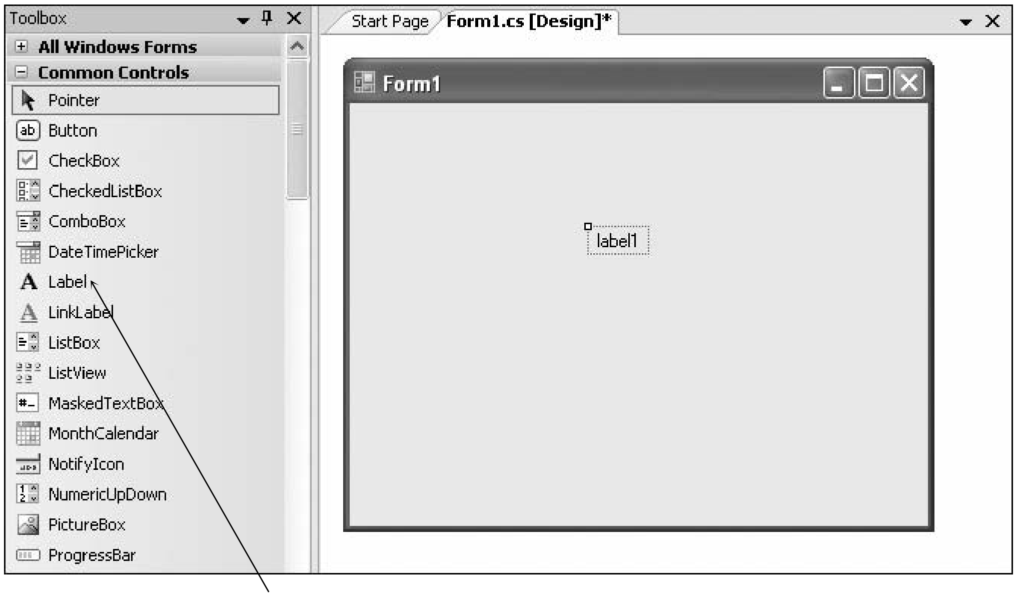
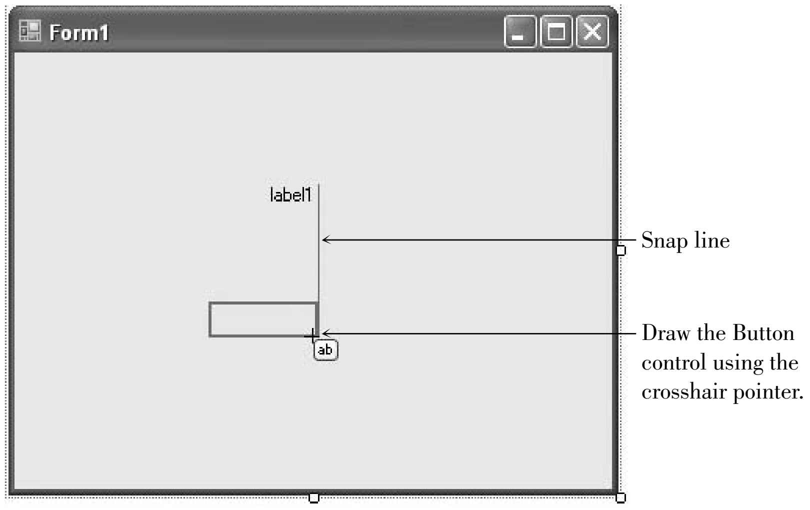


Figure 1.18

Select the Button tool and drag diagonally to create a new Button control. The blue snap lines help to align controls.



resizing handles. The blue lines that appear are called **snap lines**, which can help you align your controls.

While a control is selected, you can delete it or move it. If it has resizing handles, you also can resize it. Refer to Table 1.1 for instructions for selecting, deleting, moving, and resizing controls. Click outside of a control to deselect it.

Selecting, Deleting, Moving, and Resizing Controls on a Form. Table 1.1

Select a control	Click on the control.
Delete a control	Select the control and then press the Delete key on the keyboard.
Move a control	Select the control, point inside the control (not on a handle), press the mouse button, and drag it to a new location.
Resize a control	Make sure the control is selected and has resizing handles; then either point to one of the handles, press the mouse button, and drag the handle; or drag the form's bottom border to change the height or the side border to change the width. Note that the default format for Labels does not allow resizing.

STEP 3: While the first button is still selected, point to the Button tool in the toolbox and double-click. A new button of the default size will appear on top of the last-drawn control (Figure 1.19).

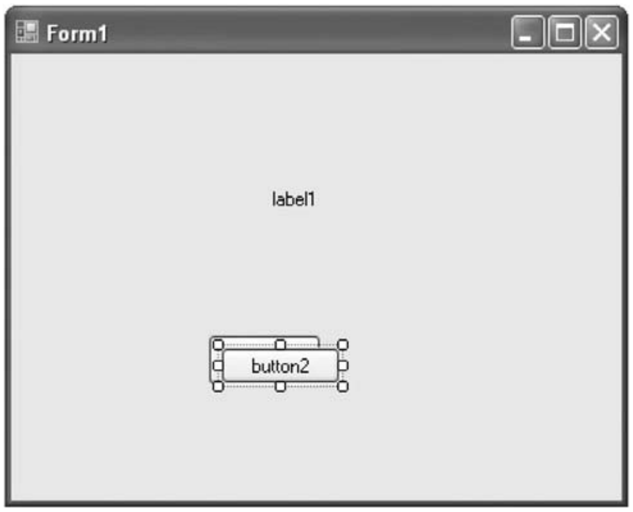


Figure 1.19

Place a new button on the form by double-clicking the Button tool in the toolbox. The new button appears on top of the previously selected control.

STEP 4: Keep the new button selected, point anywhere inside the button (not on a handle), and drag the button below your first button (Figure 1.20).

STEP 5: Select each control and move and resize the controls as necessary. Make the two buttons the same size and line them up. Use the snap lines to help with the size and alignment. Note that you can move but not resize the label.

At this point you have designed the user interface and are ready to set the properties.

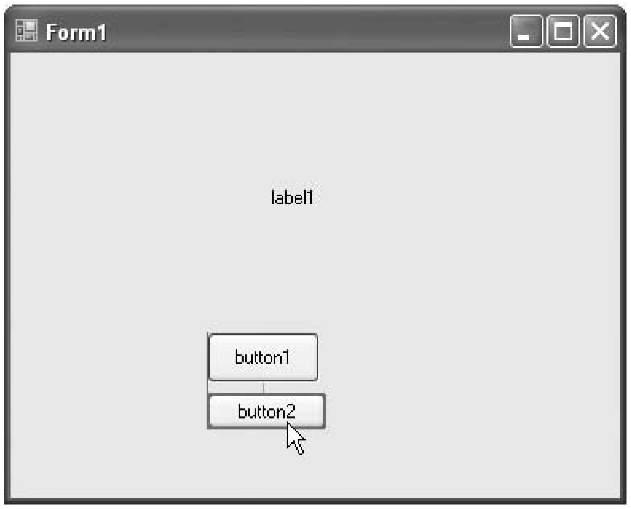
Set Properties

Set the Name and Text Properties for the Label

STEP 1: Click on the label you placed on the form; an outline appears around the control. Next, click on the title bar of the Properties window to make it the active window (Figure 1.21).

Figure 1.20

Drag the new button (button2) below button1.

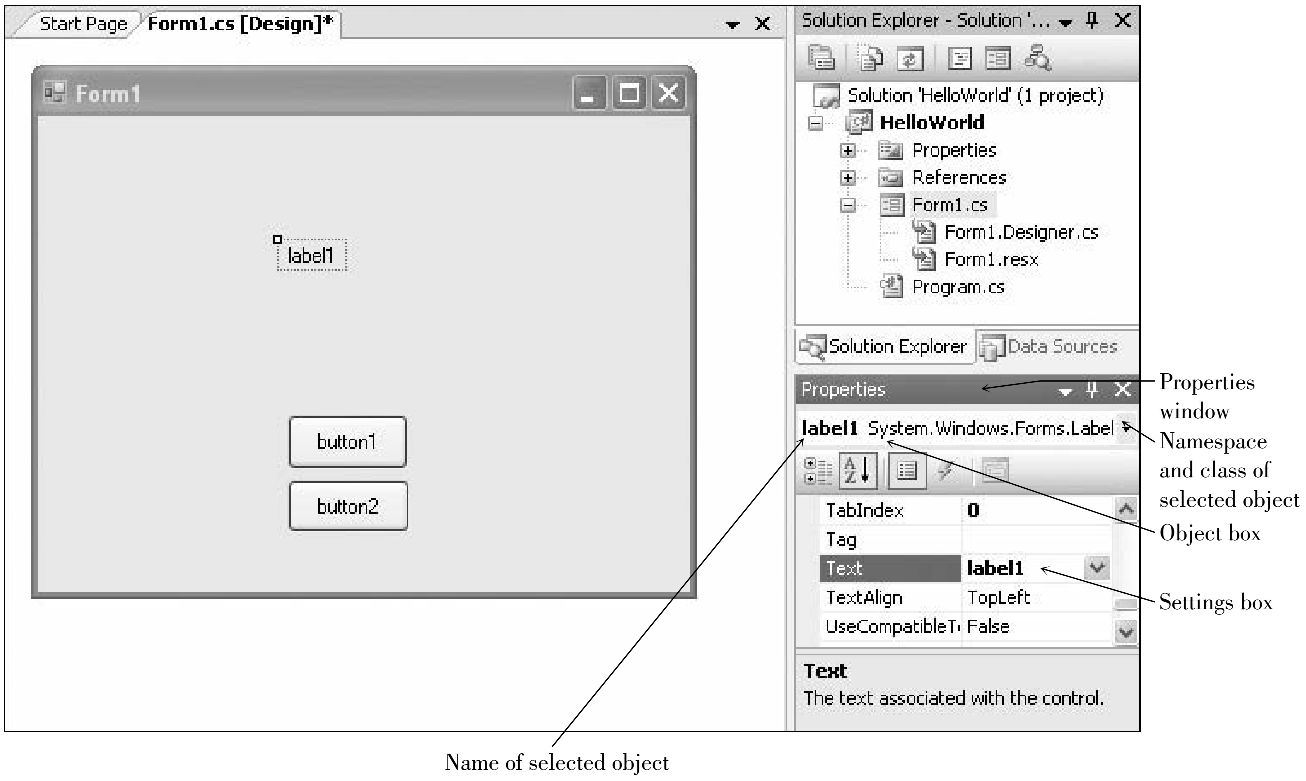


TIP

If no control is selected when you double-click a tool, the new control is added to the upper-left corner of the form. ■

Figure 1.21

The currently selected control is shown in the Properties window.



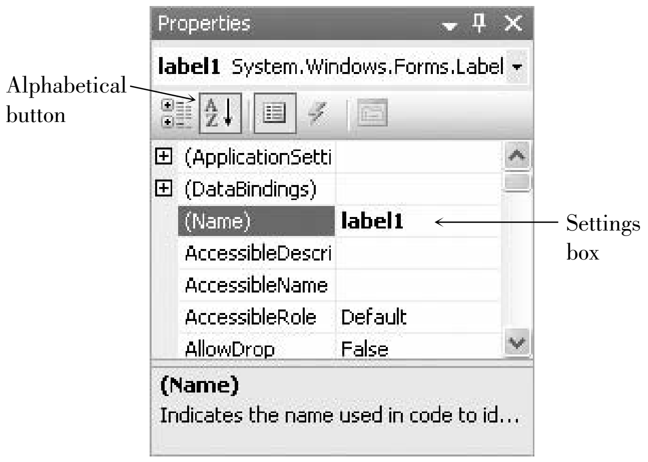
TIP

If the Properties window is not visible, you can choose *View / Properties Window* or press the F4 key to show it. ■

Notice that the Object box at the top of the Properties window is showing *label1* (the name of the object) and *System.Windows.Forms.Label* as the class of the object. The actual class is Label; System.Windows.Forms is called the ***namespace***, or the hierarchy used to locate the class.

STEP 2: In the Properties window, click on the Alphabetical button to make sure the properties are sorted in alphabetic order. Then select the Name property, which appears near the top of the list. Click on *(Name)* and notice that the Settings box shows *label1*, the default name of the label (Figure 1.22).

Figure 1.22



⊞ (ApplicationSetti	
⊞ (DataBindings)	
(Name)	label1
AccessibleDescri	
AccessibleName	
AccessibleRole	Default
AllowDrop	False

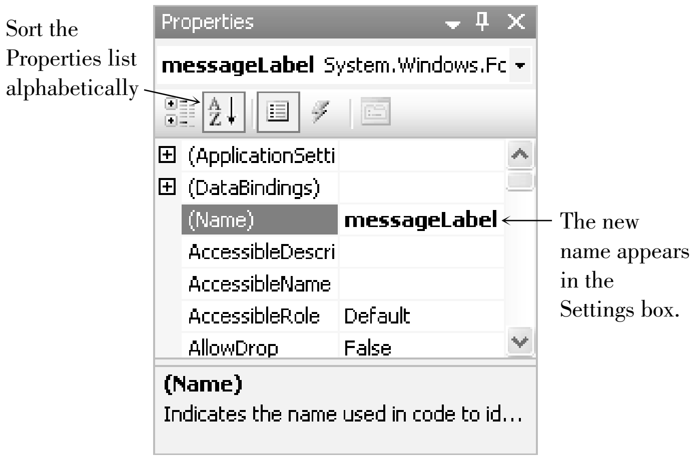
(Name)
Indicates the name used in code to id...

The Properties window. Click on the Name property to change the value in the Settings box.

STEP 3: Type "messageLabel" (without the quotation marks). See Figure 1.23. As a shortcut, you may wish to delete the "1" from the end of "label1", press the Home key to get to the beginning of the word, and then type "message". Change the "l" for Label to uppercase.

After you change the name of the control and press Enter or Tab, you can see the new name in the Object box's drop-down list.

Figure 1.23


Sort the Properties list alphabetically
The new name appears in the Settings box.
Properties
messageLabel System.Windows.Fc

⊞ (ApplicationSetti	
⊞ (DataBindings)	
(Name)	messageLabel
AccessibleDescri	
AccessibleName	
AccessibleRole	Default
AllowDrop	False

(Name)
Indicates the name used in code to id...

Type "messageLabel" into the Settings box for the Name property.

STEP 4: Select the AutoSize property and change the value to False. You can easily change a property from True to False in several ways: (1) Click in the word "True" and type only the letter "f", the value changes automatically; (2) Double-click on either the property name (AutoSize) or the property value (True), the value toggles each time you double-click; or (3) Click on either the property name or the property value and a drop-down arrow appears at the right end of the Settings box. Drop down the list and make your selection from the possible values (True or False, in this case).

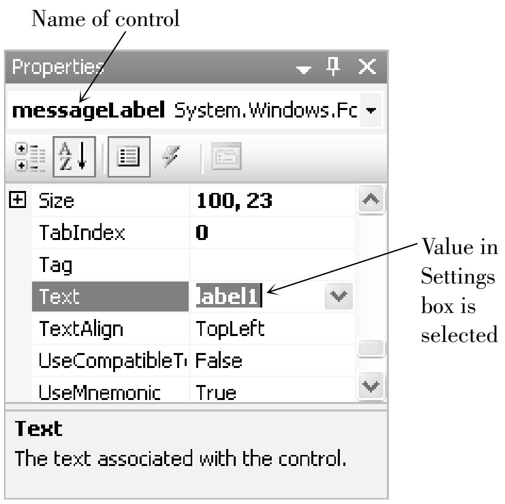
STEP 5: Click on the Text property to select it. (Scroll the list if necessary.)

The **Text property** of a control determines what will be displayed on the form. Because nothing should display when the program begins, you must delete the value of the Text property (as described in the next two steps).

STEP 6: Double-click on *label1* in the Settings box; the entry should appear selected (highlighted). See Figure 1.24.

Figure 1.24

Double-click in the Settings box to select the entry.


Name of control
Properties
messageLabel System.Windows.Fc
Value in Settings box is selected

Size	100, 23
TabIndex	0
Tag	
Text	label1
TextAlign	TopLeft
UseCompatibleTe	False
UseMnemonic	True

Text
The text associated with the control.

STEP 7: Press the Delete key to delete the value of the Text property. Then press Enter and notice that the label on the form appears empty. Changes do not appear until you press Enter or move to another property or control.

As an alternate technique, you can double-click on the property name, which automatically selects the entry in the Settings box. Then you can press the Delete key or just begin typing to change the entry.

All you see is a very small selection border (Figure 1.25), and if you click anywhere else on the form, which deselects the label, you cannot see it at all.

If you need to select the label after deselecting it, you can click in the approximate spot on the form or use the Properties window: Drop down the Object list at the top of the window; you can see a list of all controls on the form and can make a selection (Figure 1.26).

TIP

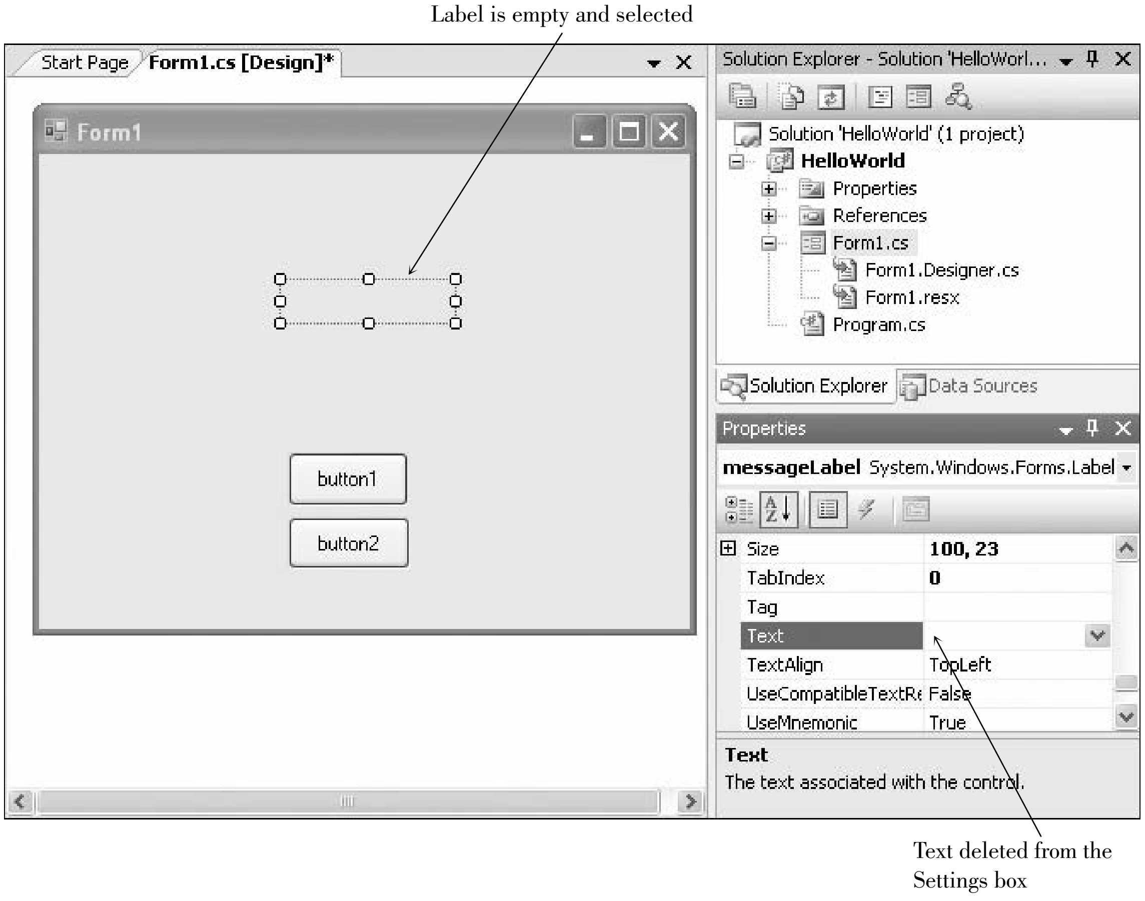
Don't confuse the Name property with the Text property. You will use the Name property to refer to the control in your C# code. The Text property determines what the user will see on the form. C# sets both of these properties to the same value by default and it is easy to confuse them. ■

Lock the Controls

STEP 1: Point anywhere on the form and click the right mouse button to display a **context menu**. On the context menu, select *Lock Controls* (Figure 1.27). Locking prevents you from accidentally moving the controls. When your

Figure 1.25

Delete the value for the Text property from the Settings box; the label on the form also appears empty.

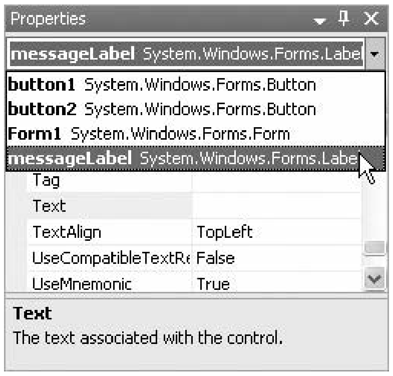

Label is empty and selected
Start Page
Form1.cs [Design]*
Form1
button1
button2
Solution Explorer - Solution 'HelloWorl...
Solution 'HelloWorld' (1 project)
HelloWorld
Properties
References
Form1.cs
Form1.Designer.cs
Form1.resx
Program.cs
Solution Explorer
Data Sources
Properties
messageLabel System.Windows.Forms.Label
Text deleted from the Settings box

Size	100, 23
TabIndex	0
Tag	
Text	
TextAlign	TopLeft
UseCompatibleTextRe	False
UseMnemonic	True

Text
The text associated with the control.

Figure 1.26

Drop down the Object box in the Properties window to select any control on the form.


Properties
messageLabel System.Windows.Forms.Label
button1 System.Windows.Forms.Button
button2 System.Windows.Forms.Button
Form1 System.Windows.Forms.Form
messageLabel System.Windows.Forms.Label

Tag	
Text	
TextAlign	TopLeft
UseCompatibleTextRe	False
UseMnemonic	True

Text
The text associated with the control.

controls are locked, a selected control has a small lock icon in the upper-left corner instead of resizing handles (Figure 1.28).

Note: You can unlock the controls at any time if you wish to redesign the form. Just click again on *Lock Controls* on the context menu to deselect it.

Figure 1.27

After the controls are placed into the desired location, lock them in place by selecting Lock Controls *from the context menu. Remember that context menus differ depending on the current operation and system setup.*

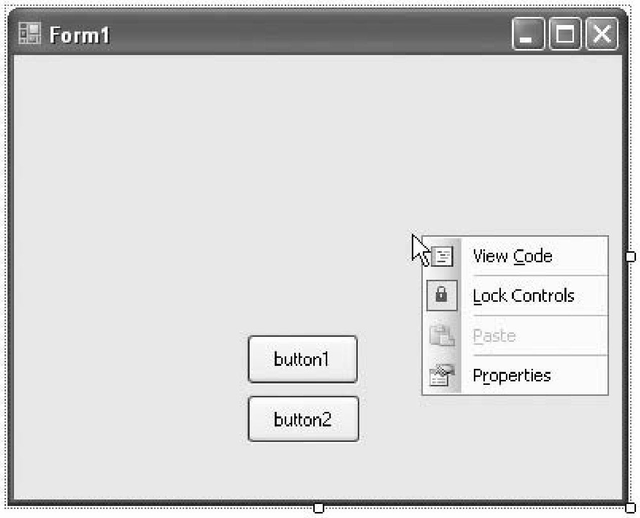
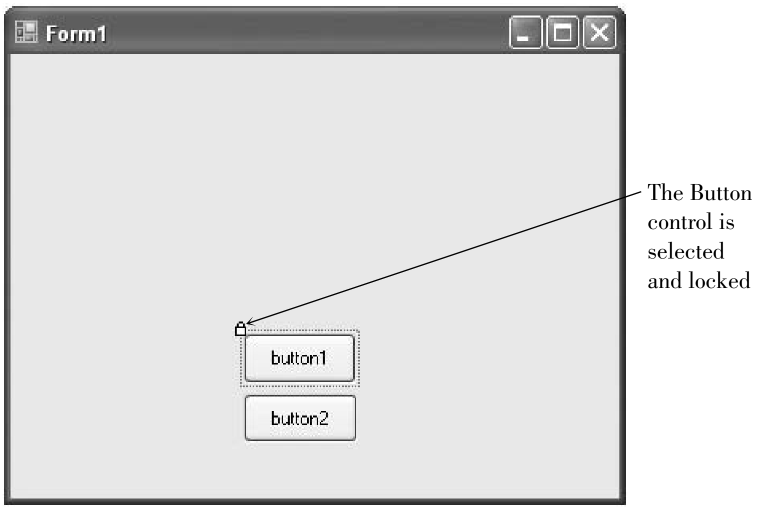


Figure 1.28

After you lock the controls on a form, a selected control has a lock icon instead of resizing handles.



Set the Name and Text Properties for the First Button

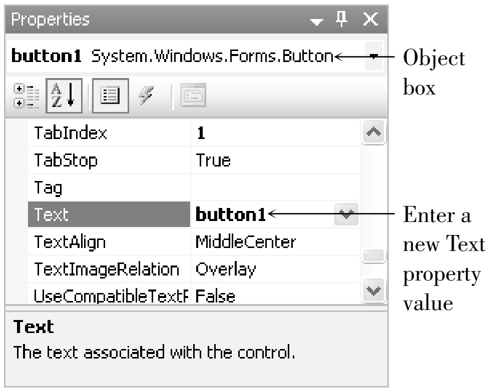
STEP 1: Click on the first button (button1) to select it and then look at the Properties window. The Object box should show the name (*button1*) and class (*System.Windows.Forms.Button*) of the button (Figure 1.29).

Problem? If you should double-click and code appears in the Document window, simply click on the *Form1.cs [Design]* tab at the top of the window.

STEP 2: Change the Name property of the button to “displayButton” (without the quotation marks).

Although the project would work fine without this step, we prefer to give this button a meaningful name, rather than use button1, its default name. The guidelines for naming controls appear later in this chapter in the section “Naming Rules and Conventions for Objects.”

Figure 1.29


Properties
button1 System.Windows.Forms.Button
Object box
Enter a new Text property value

TabIndex	1
TabStop	True
Tag	
Text	button1
TextAlign	MiddleCenter
TextImageRelation	Overlay
UseCompatibleTextF	False

Text
The text associated with the control.

Change the properties of the first button.

STEP 3: Change the Text property to "Display" (without the quotation marks). This step changes the words that appear on top of the button.

TIP

Always set the Name property of controls before writing code. Although the program will still work if you reverse the order, the method names won't match the control names, which can cause confusion. ■

Set the Name and Text Properties for the Second Button

STEP 1: Select button2 and change its Name property to "exitButton."

STEP 2: Change the Text property to "Exit."

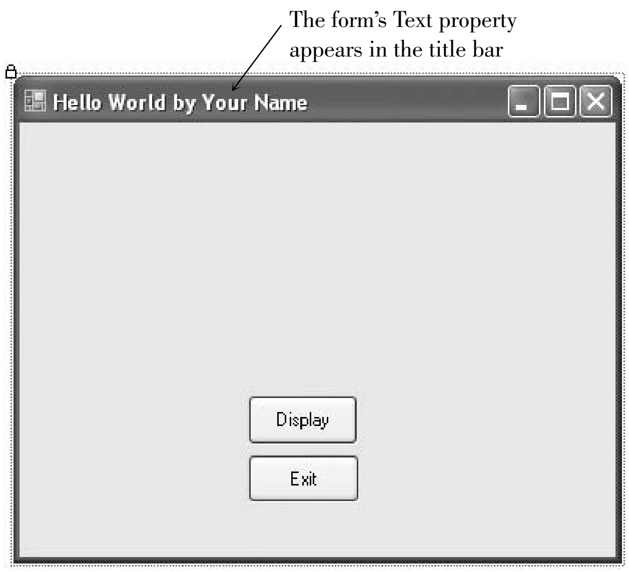
Change Properties of the Form

STEP 1: Click anywhere on the form, except on a control. The Properties window Object box should now show the form as the selected object (*Form1* as the object's name and *System.Windows.Forms.Form* as its class).

STEP 2: Change the Text property to "Hello World by Your Name" (again, no quotation marks and use your own name).

The Text property of a form determines the text to appear in the title bar. Your screen should now look like Figure 1.30.

Figure 1.30



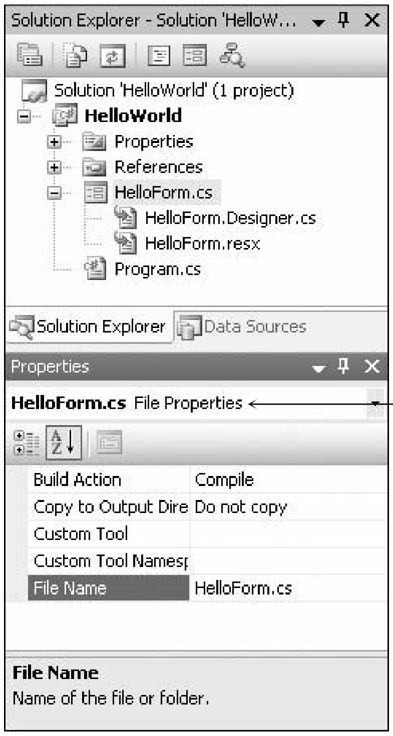
Change the form's Text property to set the text that appears in the form's title bar.

STEP 3: Click on the StartPosition property and notice the arrow on the property setting, indicating a drop-down list. Drop down the list and select *CenterScreen*. This will make your form appear in the center of the screen when the program runs.

STEP 4: In the Solution Explorer, right-click on Form1.cs and choose *Rename* from the context menu. Change the file name to "HelloForm.cs", making sure to retain the .cs extension. Press Enter when finished. This changes the name of the file that saves to disk as well as the name of the class (Figure 1.31).

Figure 1.31

The Properties window shows the file's properties with the new name for the file. You can change the filename in the Properties window or the Solution Explorer.



Build Action	Compile
Copy to Output Dire	Do not copy
Custom Tool	
Custom Tool Namesp	
File Name	HelloForm.cs

File Name
Name of the file or folder.

STEP 5: Click on the form in the Document window, anywhere except on a control. The name of the file appears on the tab at the top of the Designer window and the Properties window shows properties for the form's class, not the file. The C# designer changed the name of the form's class to match the name of the file (Figure 1.32).

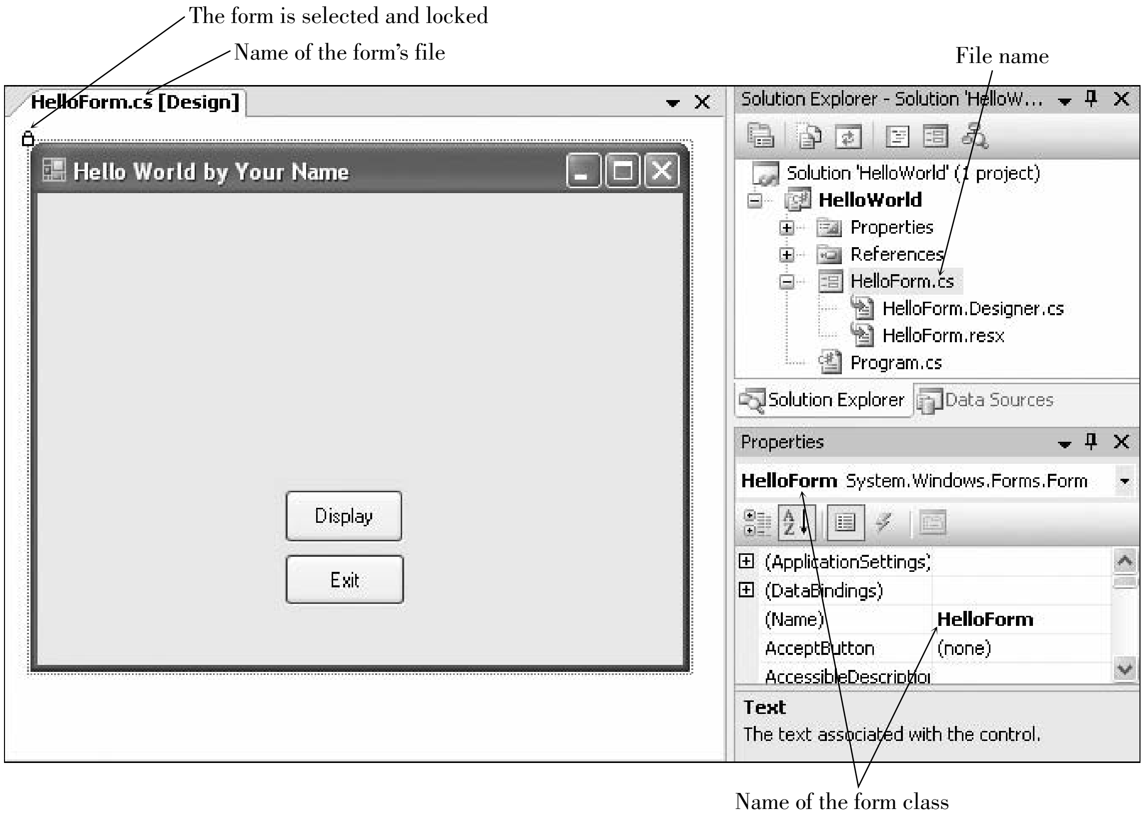
Write Code

C# Events

While your project is running, the user can do many things, such as move the mouse around; click either button; move, resize, or close your form's window; or jump to another application. Each action by the user causes an event to occur in your C# project. Some events (like clicking on a button) you care about, and

Figure 1.32

The Properties window for the form. The form's class name now matches the name of the form's file.



some events (like moving the mouse and resizing the window) you do not care about. If you write code for a particular event, then C# will respond to the event and automatically execute your method. *C# ignores events for which no methods are written.*

TIP

If you change the form's file name before changing the form's class name, the IDE automatically changes the form's class name to match the file name. It does not make the change if you have changed the form's class name yourself. ■

C# Event Handlers

You write code in C# in methods. For now, each method will begin with the words `private void` and the code will be enclosed in opening and closing braces { }.

C# automatically names your **event-handling methods** (also called ***event handlers***). The name consists of the object name, an underscore (_), and the name of the event. For example, the Click event for your button called displayButton will be displayButton_Click. For the sample project you are writing, you will have a displayButton_Click method and an exitButton_Click method.

C# Code Statements

This first project requires two C# statements: the **comment** and the **assignment statement**. You also will execute a method of an object.

The Comment Statement

Comment statements, sometimes called *remarks*, are used for project documentation only. They are not considered "executable" and have no effect when the program runs. The purpose of comments is to make the project more readable and understandable by the people who read it.

Good programming practices dictate that programmers include comments to clarify their projects. Every method should begin with a comment that describes its purpose. Every project should have comments that explain the purpose of the program and provide identifying information such as the name of the programmer and the date the program was written and/or modified. In addition, it is a good idea to place comments within the logic of a project, especially if the purpose of any statements might be unclear.

When you try to read someone else's code or your own after a period of time, you will appreciate the generous use of comments.

C# comments begin with slashes. Most of the time, your comments will be on a separate line. You also can add slashes and a comment to the right end of a line of code.

The Comment Statement—Examples

Examples

```
// This project was written by Jonathon Edwards.
// Exit the project.
messageLabel.Text = "Hello World"; // Assign the message to the Text property.
```

Multiline Comments You also can create multiline comments by placing /* at the beginning and */ at the end. The enclosing symbols can be on lines by themselves or on existing lines. As you type additional lines between the beginning and ending symbols, the editor adds an asterisk at the start of each line, indicating that it is a comment line. However, you do not need the * at the beginning of each line. When you want to turn multiple lines of code into comments, just add the opening /* and ending */.

```
/*
 *   Project:      Ch01HandsOn
 *   Programmer:   Bradley/Millspaugh
 *   Date:         June 2007
 *   Description:  This project displays a Hello World message
 *                   using labels and buttons.
 * */

/*Project:    Ch01HandsOn
Programmer:   Bradley/Millspaugh
Date:         June 2007
Description:  This project displays a Hello World message
                using labels and buttons. */
```

Ending a Statement

Most C# statements must be terminated by a semicolon (;). Comments and a few other statements (which you will learn about later) do not end with a semicolon. A C# statement may extend over multiple lines; the semicolon indicates that the statement is complete.

The Assignment Statement

The assignment statement assigns a value to a property or variable (you learn about variables in Chapter 3). Assignment statements operate from right to left;

that is, the value that appears on the right side of the equal sign is assigned to the property named on the left of the equal sign. It is often helpful to read the equal sign as "is replaced by." For example, the following assignment statement would read "messageLabel.Text is replaced by Hello World."

```
messageLabel.Text = "Hello World";
```

The Assignment Statement—General Form

General Form

```
Object.Property = value;
```

The value named on the right side of the equal sign is assigned to (or placed into) the property named on the left.

The Assignment Statement—Examples

Examples

```
titleLabel.Text = "A Snazzy Program";
addressLabel.Text = "1234 South North Street";
messageLabel.AutoSize = true;
numberInteger = 12;
```

Notice that when the value to assign is some actual text (called a *literal*), it is enclosed in quotation marks. This convention allows you to type any combination of alpha and numeric characters. If the value is numeric, do not enclose it in quotation marks. And do not place quotation marks around the terms *true* and *false*, which C# recognizes as special key terms.

Ending a Program by Executing a Method

To execute a method of an object, you write

```
Object.Method();
```

Notice that methods always have parentheses. Although this might seem like a bother, it's helpful to distinguish between properties and methods: Methods always have parentheses; properties don't.

Examples

```
helloButton.Hide();
messageLabel.Show();
```

To execute a method of the current form, you use the **`this`** keyword for the object. And the method that closes the form and terminates the project execution is `Close`.

```
this.Close();
```

In most cases, you will include `this.Close()` in the event-handling method for an Exit button or an *Exit* menu choice.

Note: Remember, the keyword `this` refers to the current object. You can omit `this`, since a method without an object reference defaults to the current object.

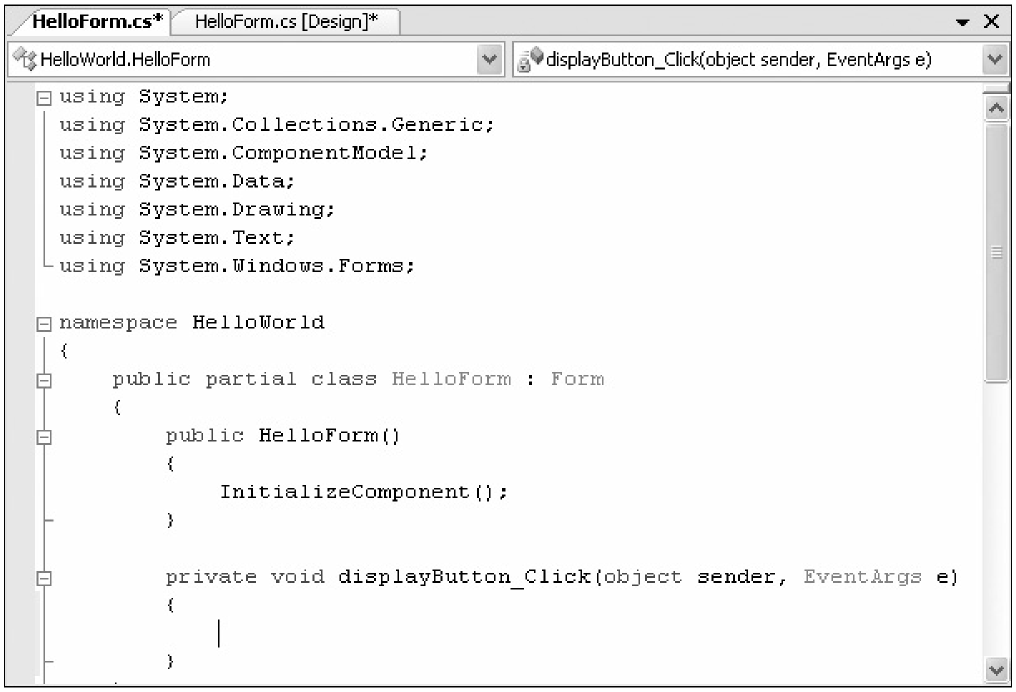
Code the Event-Handling Methods for Hello World

Code the Click Event Handler for the Display Button

STEP 1: Double-click the Display button. The Visual Studio editor opens with the header line of your method already in place, with the insertion point indented inside the opening and closing braces (Figure 1.33).

Figure 1.33

The Editor window, showing the first line of the displayButton_Click event handler with the insertion point between the opening and closing braces.



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

namespace HelloWorld
{
    public partial class HelloForm : Form
    {
        public HelloForm()
        {
            InitializeComponent();
        }

        private void displayButton_Click(object sender, EventArgs e)
        {
            |
        }
```

STEP 2: Type this comment statement:

```
// Display the Hello World message.
```

Notice that the editor automatically displays comments in green (unless you or someone else has changed the color with an Environment option).

Follow good coding conventions and indent all lines between the opening and closing braces. The smart editor attempts to help you follow this convention. Also, always leave a blank line after the comments at the top of a method.

STEP 3: Press Enter twice and then type this assignment statement:

```
messageLabel.Text = "Hello World";
```

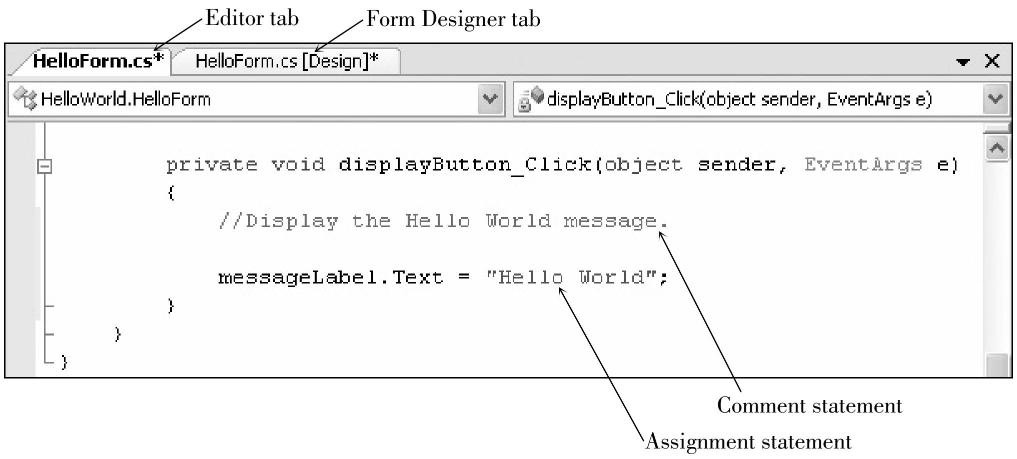
Note: When you start typing the first letters of messageLabel, IntelliSense pops up. Although you *can* type the entire word, you can allow IntelliSense to help you. As soon as you type the *m*, the list automatically scrolls to the first word that begins with *m*. Type the next letter, *e*, and the property *messageLabel* appears highlighted. You can press the period to select the word and an IntelliSense list pops up showing the properties and methods available for a Label control. After typing "Te" or selecting Text from the list, you can press the spacebar to complete the word.

This assignment statement assigns the literal "Hello World" to the Text property of the control called messageLabel. Compare your screen to Figure 1.34.

STEP 4: Return to the form designer (Figure 1.32) by clicking on the *HelloForm.cs [Design]* tab on the Document window (refer to Figure 1.34).

Figure 1.34

Type the comment and assignment statement for the displayButton_Click event handler.



```
        private void displayButton_Click(object sender, EventArgs e)
        {
            //Display the Hello World message.

            messageLabel.Text = "Hello World";
        }
    }
}
```

TIP Allow the Editor and IntelliSense to help you. If the IntelliSense list does not pop up, likely you misspelled the name of the control. ■

Code the Click Event Handler for the Exit Button

STEP 1: Double-click the Exit button to open the editor for the exitButton_Click event handler.

STEP 2: Type this comment:

```
// Exit the project.
```

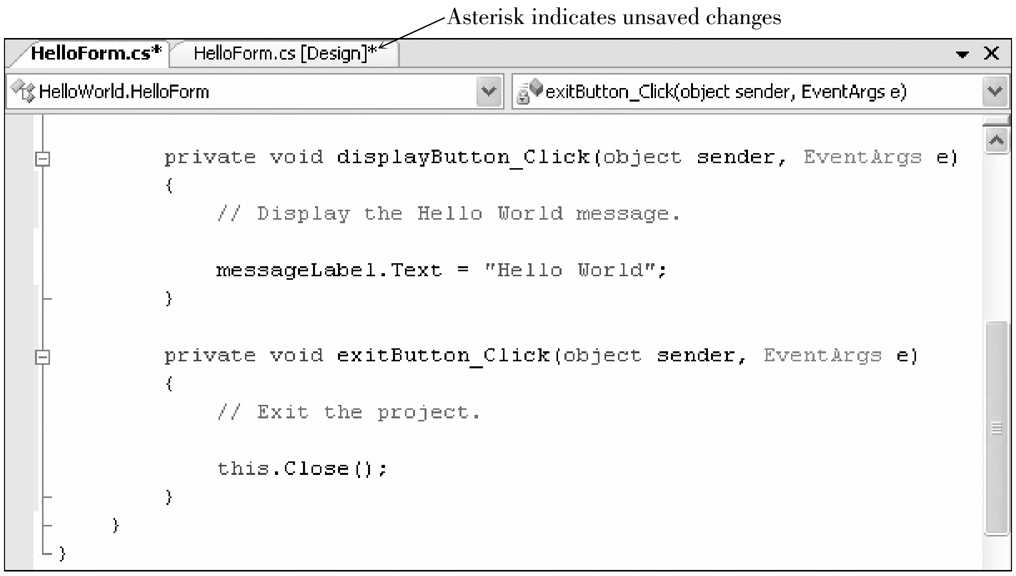
STEP 3: Press Enter twice and type this C# statement:

```
    this.Close();
```

STEP 4: Make sure your code looks like the code shown in Figure 1.35.

Figure 1.35

Type the code for the exitButton_Click event handler. Notice that an asterisk appears on the tab at the top of the window, indicating that there are unsaved changes in the file.


Asterisk indicates unsaved changes
HelloForm.cs*
HelloForm.cs [Design]*
HelloWorld.HelloForm
exitButton_Click(object sender, EventArgs e)

```
        private void displayButton_Click(object sender, EventArgs e)
        {
            // Display the Hello World message.

            messageLabel.Text = "Hello World";
        }

        private void exitButton_Click(object sender, EventArgs e)
        {
            // Exit the project.

            this.Close();
        }
    }
}
```

Run the Project

After you have finished writing the code, you are ready to run the project. Use one of these three techniques:

1. Open the *Debug* menu and choose *Start Debugging*.
2. Press the *Start Debugging* button on the toolbar.
3. Press F5, the shortcut key for the *Start Debugging* command.

TIP

Accept an entry from the IntelliSense popup list by typing the punctuation that follows the entry, by pressing the spacebar, or by pressing the Enter key. You also can scroll the list and select with your mouse. ■

Start the Project Running

STEP 1: Choose one of the three methods previously listed to start your project running.

Problems? See "Finding and Fixing Errors" later in this chapter. You must correct any errors and restart the program.

If all went well, the form appears and the Visual Studio title bar now indicates that you are in run time (Figure 1.36).

TIP

If your form disappears during run time, click its button on the Windows task bar. ■

Click the Display Button

STEP 1: Click the Display button. Your "Hello World" message appears in the label (Figure 1.37).

Figure 1.36

The form of the running application.

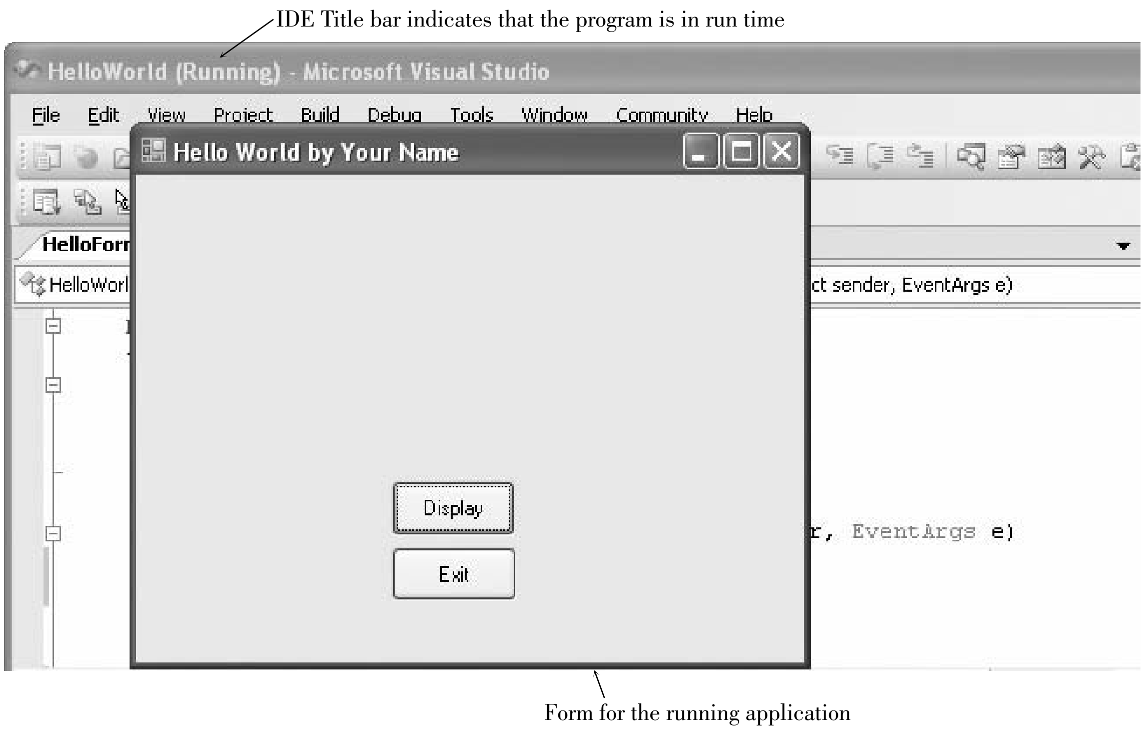
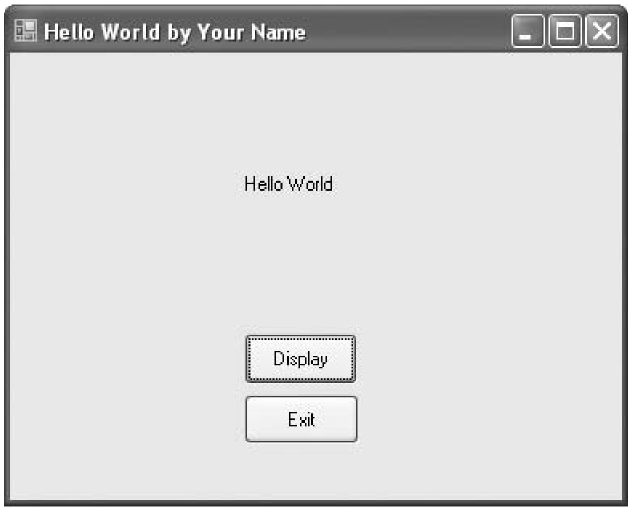


Figure 1.37

Click the Display button and "Hello World" appears in the label.



Click the Exit Button

STEP 1: Click the Exit button. Your project terminates, and you return to design time.

Save Your Work

Of course, you must always save your work often. Except for a very small project such as this one, you will usually save your work as you go along. Unless you (or someone else) have changed the setting in the IDE's *Options* dialog box, your files are automatically saved in a temporary location each time you build (compile) or execute (run) your project. After you have performed a save to a different location, files are automatically resaved each time you compile or run. You also can save the files as you work.

TIP

Click the *Save All* toolbar button to quickly save all of your work. ■

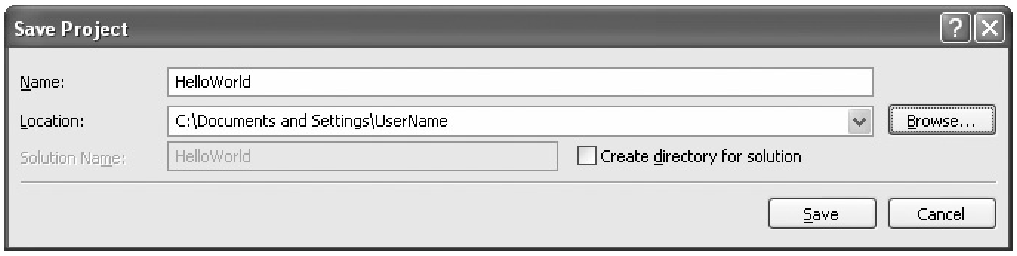
Save the Files

STEP 1: Open the Visual Studio *File* menu and choose *Save All.* This option will save the current form, project, and solution files.

STEP 2: In the *Save Project* dialog box (Figure 1.38), the project name that you chose earlier appears. Browse to the folder where you want to save your project. Make sure that the *Create directory for solution* check box is not checked. By default, Visual Studio creates a new folder to hold your project files. If you choose the option to create another directory, you will have one folder inside another folder, both with the same name.

Figure 1.38

In the Save Project dialog box, browse to select the folder in which to save the project; do not select the option to create another directory for the solution.



Save Project

Name:	HelloWorld
Location:	C:\Documents and Settings\UserName
Solution Name:	HelloWorld

☐ Create directory for solution

To Save or Not to Save As you learned earlier, by default Visual Studio saves a new project in a temporary location. Each time you compile or run, VS re-saves the project files. You do not have to save the project in a more permanent location unless you want to, which can be handy when you just want to test something and don't want to keep it. If you choose *File / Close Solution*, begin a new project, or close the IDE, you will be given the choice to either save or discard the temporary project.

Note: When saving a project, do not attempt to save a modified version by giving the project a new name. If you want to move or rename the project, it must be closed. See Appendix C for help.

Close the Project

STEP 1: Open the *File* menu and choose *Close Solution.* If you haven't saved since your last change, you will be prompted to save.

Open the Project

Now is the time to test your save operation by opening the project from disk. You can choose one of three ways to open a saved project:

- Select *Open Project* from the Visual Studio *File* menu and browse to find your .sln file.
- Choose the project from the *Files / Recent Projects* menu item.
- Choose the project from Recent Projects (if available) on the Start Page (*View / Other Windows / Start Page*).

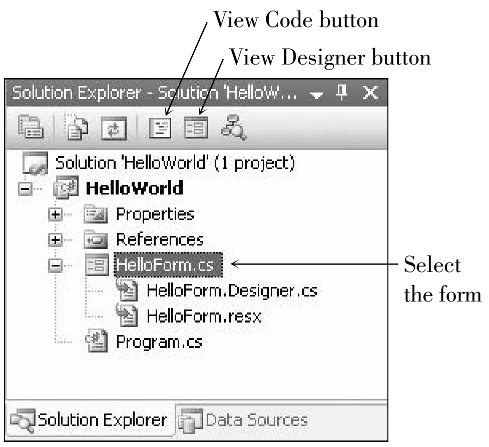
Open the Project File

STEP 1: Open your project by choosing one of the previously listed methods. Remember that the file to open is the .sln file.

If you do not see your form on the screen, check the Solution Explorer window—it should say *HelloWorld* for the project. Select the icon for your form: HelloForm.cs. You can double-click the icon or single-click and click on the *View Designer* button at the top of the Solution Explorer (Figure 1.39); your form will appear in the Designer window. Notice that you also can click on the *View Code* button to display your form's code in the Editor window.

Figure 1.39

To display the form layout, select the form name and click on the View Designer *button, or double-click on the form name. Click on the* View Code *button to display the code in the editor.*



Modify the Project

Now it's time to make some changes to the project. We'll change the size of the "Hello World" message, display the message in two different languages, and display the programmer name (that's you) on the form.

Change the Size and Alignment of the Message

STEP 1: Right-click the form to display the context menu. If your controls are currently locked, select *Lock Controls* to unlock the controls so that you can make changes.

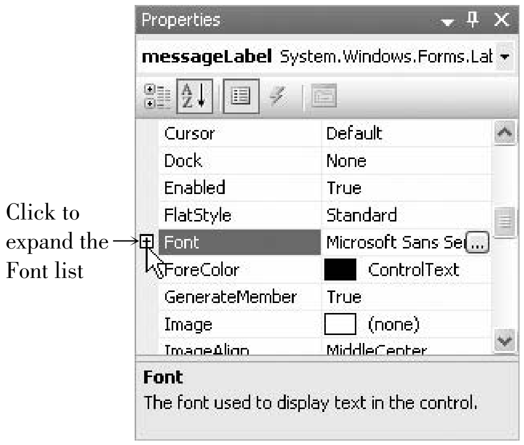
STEP 2: Drop down the Object list at the top of the Properties window and select messageLabel, which will make the label appear selected.

STEP 3: Scroll to the Font property in the Properties window. The Font property is actually a Font object that has a number of properties. To see the Font properties, click on the small plus sign on the left (Figure 1.40); the Font properties will appear showing the current values (Figure 1.41).

You can change any of the Font properties in the Properties window, such as setting the Font's Size, Bold, or Italic properties. You also can display the *Font* dialog box and make changes there.

Figure 1.40

Click on the Font's plus sign to view the properties of the Font object.

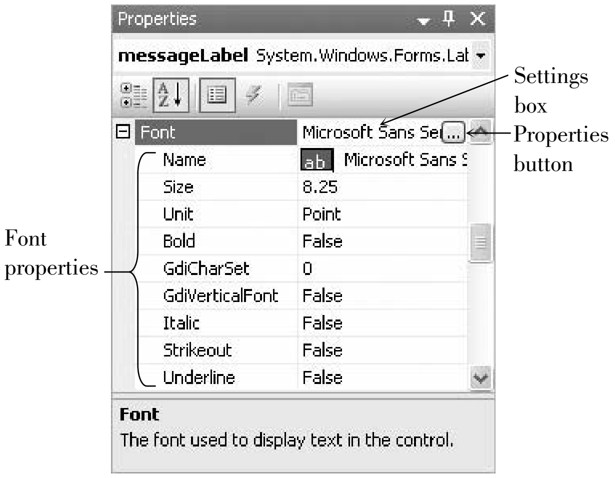

Click to expand the Font list
Properties
messageLabel System.Windows.Forms.Lat

Cursor	Default
Dock	None
Enabled	True
FlatStyle	Standard
⊞ Font	Microsoft Sans Se...
ForeColor	■ ControlText
GenerateMember	True
Image	□ (none)
ImageAlign	MiddleCenter

Font
The font used to display text in the control.

Figure 1.41

You can change the individual properties of the Font object.



⊟ Font	Microsoft Sans Se...
Name	ab Microsoft Sans S
Size	8.25
Unit	Point
Bold	False
GdiCharSet	0
GdiVerticalFont	False
Italic	False
Strikeout	False
Underline	False

Font
The font used to display text in the control.

STEP 4: Click the Properties button for the font (the button with the ellipsis on top) to display the *Font* dialog box (Figure 1.42). Select 12 point if it is available. (If it isn't available, choose another number larger than the current setting.) Click OK to close the *Font* dialog box.

STEP 5: Select the TextAlign property. The Properties button that appears with the down-pointing arrow indicates a dropdown list of choices. Drop down the list (Figure 1.43) and choose the center box; the alignment property changes to *MiddleCenter*.

TIP

When you change a property from its default value, the property name appears bolded; you can scan down the property list and easily identify the properties that are changed from their default value. ■

Add a New Label for Your Name

STEP 1: Click on the Label tool in the toolbox and create a new label along the bottom edge of your form (Figure 1.44). (You can resize the form if necessary.)

STEP 2: Change the label's Text property to "by Your Name." (Use your name and omit the quotation marks.)

Note: You do not need to rename this label because it will never be referred to in the code.

Figure 1.42

Choose 12 point on the Font dialog box.

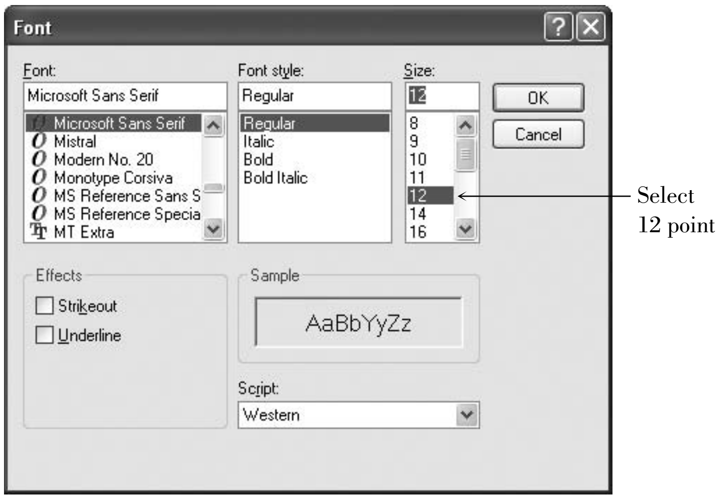
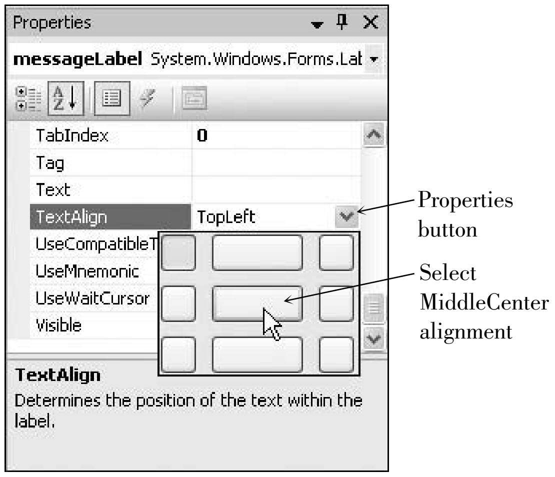


Figure 1.43

Select the center box for the TextAlign property.

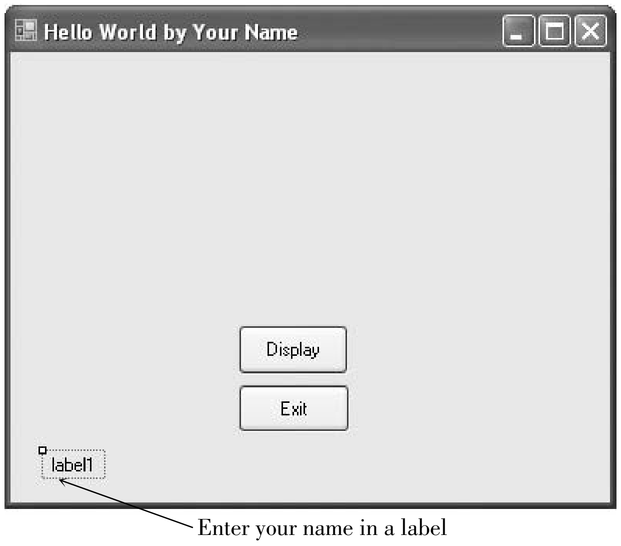

Properties
messageLabel System.Windows.Forms.Lat
TabIndex 0
Tag
Text
TextAlign TopLeft
UseCompatibleT
UseMnemonic
UseWaitCursor
Visible
TextAlign
Determines the position of the text within the label.
Properties button
Select MiddleCenter alignment

TIP

You can change the Font property of the form, which sets the default Font for all objects on the form. ■

Figure 1.44

Add a new label for your name at the bottom of the form.



The Label's AutoSize Property Earlier you changed the AutoSize Property of messageLabel to False, a step that allows you to set the size of the label yourself. When AutoSize is set to True (the default), the label resizes automatically to accommodate the Text property, which can be an advantage when the text or font size may change. However, if you plan to delete the Text property, as you did for messageLabel, the label resizes to such a tiny size that it is difficult to see.

Any time that you want to set the size of a label yourself, change the AutoSize property to False. This setting also allows you to create taller labels that allow a long Text property to wrap to multiple lines. If you set the Text property to a very long value when AutoSize is set to True, the label will resize only to the edge of the form and cut off any excess text, but if AutoSize is set to False and the label has been resized to a taller height, the long Text property will wrap.

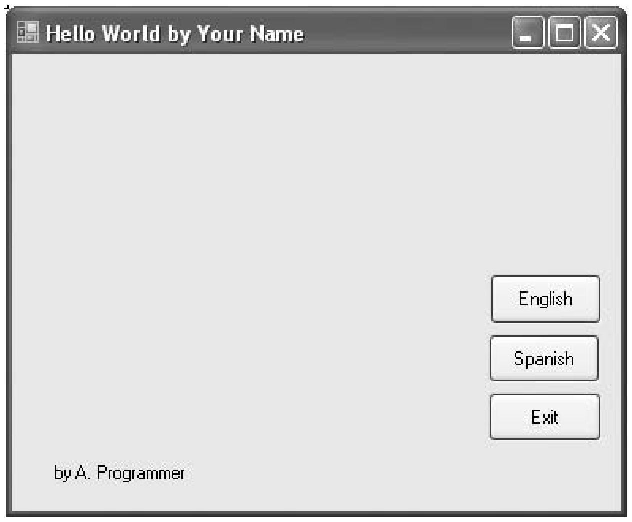
Change the Text of the Display Button

Because we plan to display the message in one of two languages, we'll change the text on the Display button to "English" and move the buttons to allow for another button.

STEP 1: Select the displayButton and change its Text property to "English."
STEP 2: Move the English button and the Exit button to the right and leave room for a Spanish button (Figure 1.45).

Figure 1.45

Move the English *and* Exit *buttons and add a* Spanish *button.*



TIP

An easy way to create multiple similar controls is to copy an existing control and paste it on the form. You can paste multiple times to create multiple controls. ■

Add a Spanish Button

STEP 1: Add a new button. Move and resize it as necessary, referring to Figure 1.45.
STEP 2: Change the Name property of the new button to spanishButton.
STEP 3: Change the Text property of the new button to "Spanish."

Add an Event Method for the Spanish Button

STEP 1: Double-click on the *Spanish* button to open the editor for spanishButton_Click.

STEP 2: Add a comment:

```
// Display the Hello World message in Spanish.
```

STEP 3: Press Enter twice and type the following line of C# code.

```
messageLabel.Text = "Hola Mundo";
```

STEP 4: Return to design view.

Lock the Controls

STEP 1: When you are satisfied with the placement of the controls on the form, display the context menu and select *Lock Controls* again.

Save and Run the Project

STEP 1: Save your project again. You can use the *File / Save All* menu command or the *Save All* toolbar button.

STEP 2: Run your project again. Try clicking on the *English* button and the *Spanish* button.

Problems? See “Finding and Fixing Errors” later in this chapter.

STEP 3: Click the *Exit* button to end program execution.

Add Comments

Good documentation guidelines require some more comments in the project. Always begin each method with comments that tell the purpose of the method. In addition, each project file needs identifying comments at the top.

STEP 1: Display the code in the editor and click in front of the first line (`using System;`). Make sure that you have an insertion point; if the entire first line is selected, press the left arrow to set the insertion point.

STEP 2: Press Enter to create a blank line.

Warning: If you accidentally deleted the first line, click *Undo* (or press Ctrl + Z) and try again.

STEP 3: Move the insertion point up to the blank line and type the following comments, one per line (Figure 1.46):

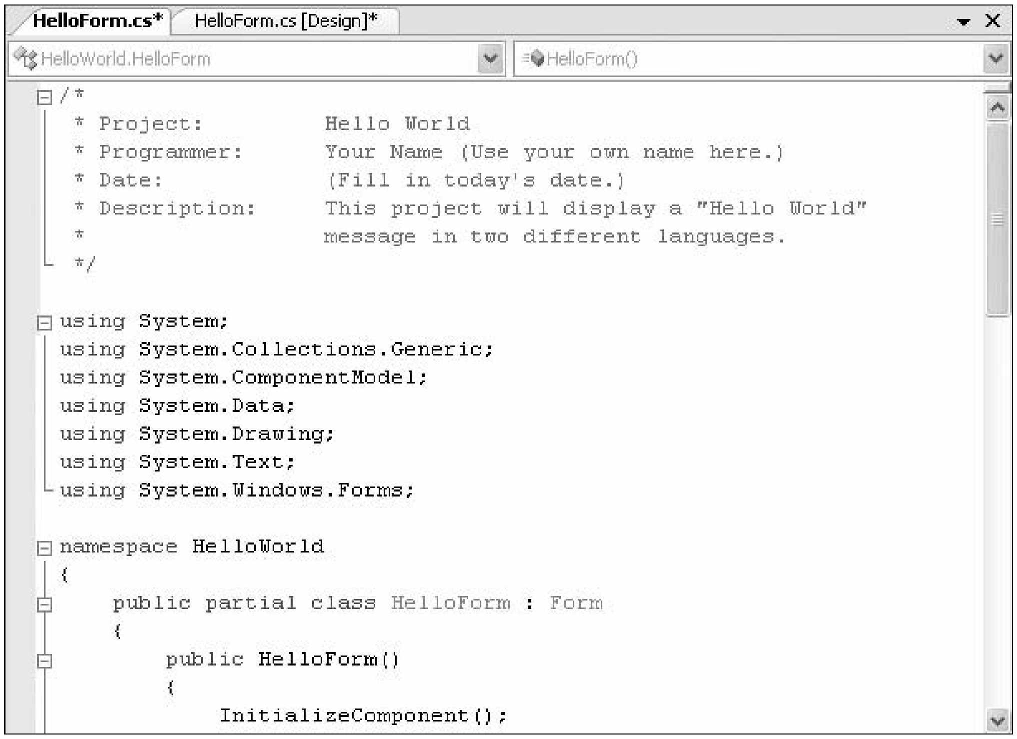
TIP

Press Ctrl + Home to quickly move the insertion point to the top of the file. ■

```
/*
 * Project:      Hello World
 * Programmer:   Your Name (Use your own name here.)
 * Date:         (Fill in today's date.)
 * Description:  This project will display a "Hello World"
 *               message in two different languages.
 */
```

Figure 1.46

Enter the comments at the top of the form file.



```
/*
 * Project:          Hello World
 * Programmer:       Your Name (Use your own name here.)
 * Date:             (Fill in today's date.)
 * Description:      This project will display a "Hello World"
 *                   message in two different languages.
 */

using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Text;
using System.Windows.Forms;

namespace HelloWorld
{
    public partial class HelloForm : Form
    {
        public HelloForm()
        {
            InitializeComponent();
```

Finish Up

STEP 1: Run the project again. Test each language button multiple times, then click the *Exit* button.

Print the Code

Select the Printing Options

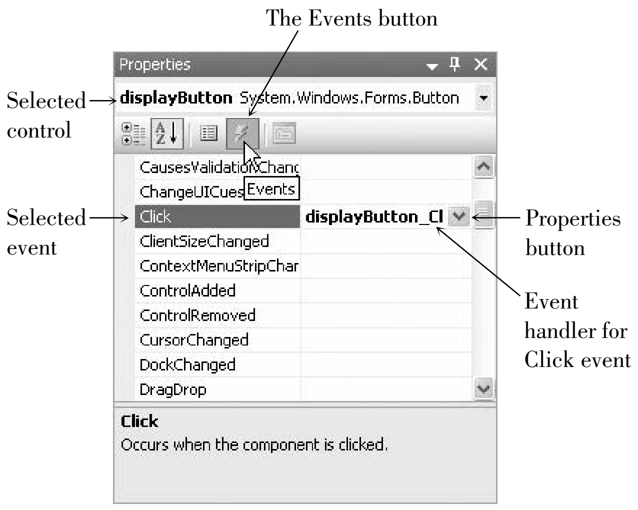
STEP 1: Make sure that the Editor window is open, showing your form's code. The *File / Print* command is disabled unless the code is displaying and its window selected.

STEP 2: Open the *File* menu and choose *Print*. Click *OK*.

View Event Handlers

You also can get to the event-handling methods for a control using the Properties window in design mode. With a button control selected, click on the *Events* button (lightning bolt) in the Properties window; all of the events for that control display (Figure 1.47). If you've already written code for the Click event, the method name appears bold in the Properties window. When you double-click on the event, the editor takes you to the method in the code window.

To write an event-handling method for any of the available events of a control, double-click the event name. You will be transferred to the Code Editor window with the insertion point inside the template for the new event handler. You also can click in any event name in the Properties window and then drop down a list of all previously written methods and select a method to assign as the event handler.



Click
Occurs when the component is clicked.

Figure 1.47

Click on the Events *button to see the available events for a selected control. Any event handlers that are already written appear in bold. Double-click an event to jump to the Editor window inside the event handler for that method, or drop down the list to select a method to assign as the handler for the event.*

A Sample Printout

This output is produced when you print the form's code. An explanation of some of the features of the code follows the listing.

```
C:\Documents and Settings\…\HelloWorld\HelloForm.cs          1
/*
 * Project:       Hello World
 * Programmer:    Your Name (Use your own name here.)
 * Date:          (Fill in today's date.)
 * Description:   This project will display a "Hello World"
 *                message in two different languages.
 */

using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Text;
using System.Windows.Forms;

namespace HelloWorld
{
    public partial class HelloForm : Form
    {
        public HelloForm()
        {
            InitializeComponent();
        }
        private void displayButton_Click(object sender, EventArgs e)
        {
            // Display the Hello World message.

            messageLabel.Text = "Hello World";
        }

        private void exitButton_Click(object sender, EventArgs e)
        {
            // Exit the project.

            this.Close();
        }

        private void spanishButton_Click(object sender, EventArgs e)
        {
            // Display the Hello World message in Spanish.

            messageLabel.Text = "Hola Mundo";
        }
    }
}
```

Automatically Generated Code

In the preceding code listing, you see many statements that you wrote, plus some more that appeared "automatically." Although a programmer *could* begin a C# program by using a simple text editor and write all of the necessary statements to make the program run, using the development tools of the Visual Studio IDE is much quicker and more efficient. The IDE adds a group of statements by default and sets up the files for the project to accommodate the majority of applications. Later, when your programs include database tables, you will have to write additional `using` statements.

The Using Statements

The `using` statements appear at the top of the file after the comments that you wrote. `Using` statements provide references to standard groups of classes from the language library. For example, the statement `using System.Windows.Forms;` allows your program to refer to all of the Windows controls that appear in the toolbox. Without the `using` statement, each time that you wanted to refer to a Label control, for example, you would have to specify the complete reference: `System.Windows.Forms.Label.messageLabel`. Instead, in the program with the `using` statement, you can just refer to `messageLabel`.

The Namespace Statement

As mentioned earlier, a namespace provides a way to refer to programming components by location or organization. In the Label example in the preceding section, "Label" is the class and "System.Windows.Forms" is the namespace, or library grouping where "Label" is found. You can think of a namespace as similar to a telephone area code: In any one area code, a single phone number can appear only once, but that same phone number can appear in any number of other area codes.

Using the .NET Framework, every program component is required to have a namespace. The VS IDE automatically adds a `Namespace` statement to your program. The default namespace is the name of your solution, but you can use a different name if you wish. Many companies use the namespace to organize applications such as the company name and functional organization, `LookSharpFitnessCenter.Payroll`, for example.

In Visual Studio, one solution can contain multiple projects. All of the solutions in this text contain only one project, so you can think of a solution and a project as being equal.

The Class Statement

In object-oriented programming, code is organized into classes. A new class can be based on (inherit from) another class, which gives the new class all of the properties and methods of the original class (the base class).

When you create a new form, you declare a new class (HelloForm in the earlier example). The new class inherits from the Form base class, which makes your new form behave like a standard form, with a title bar, maximize and minimize buttons, and resizable borders, among other behaviors.

New to VS 2005, a class may be split into multiple files. Using this feature, VS can place most of the code automatically generated by the form designer in a separate file that is part of the form's class.

The automatically generated statement

```
public partial class HelloForm : Form
```

means that this is a new class called HelloForm that inherits from the Form class. The new class is a partial class, so another file can exist that also contains statements that are part of the HelloForm class. You will learn more about classes and files in later chapters.

Finding and Fixing Errors

You already may have seen some errors as you entered the first sample project. Programming errors come in three varieties: syntax errors, run-time errors, and logic errors.

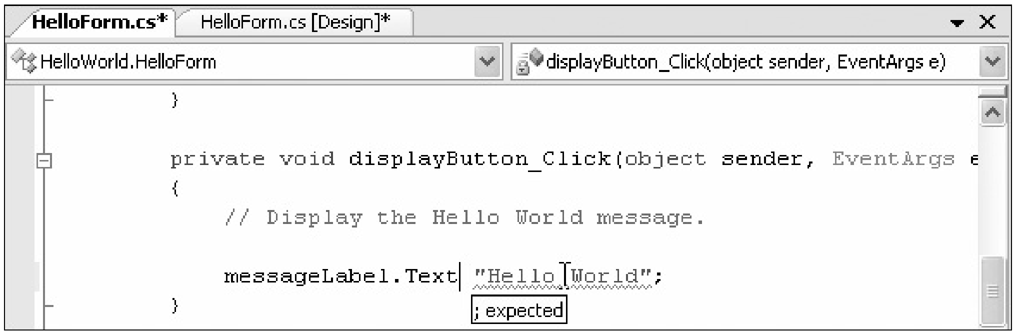
Syntax Errors

When you break C#'s rules for punctuation, format, or spelling, you generate a **syntax error**. Fortunately, the smart editor finds most syntax errors and even corrects many of them for you. The syntax errors that the editor cannot identify are found and reported by the compiler as it attempts to convert the code into intermediate machine language. A compiler-reported syntax error may be referred to as a *compile error*.

The editor identifies syntax errors as you move off the offending line. A red squiggly line appears under the part of the line that the editor cannot interpret. You can view the error message by pausing the mouse pointer over the error, which pops up a box that describes the error (Figure 1.48). You also can display an Error List window, which appears at the bottom of the Editor window and shows all error messages along with the line number of the statement that caused the error. You can display line numbers on the source code

Figure 1.48

The editor identifies a syntax error with a squiggly red line; you can point to an error to pop up the error message.



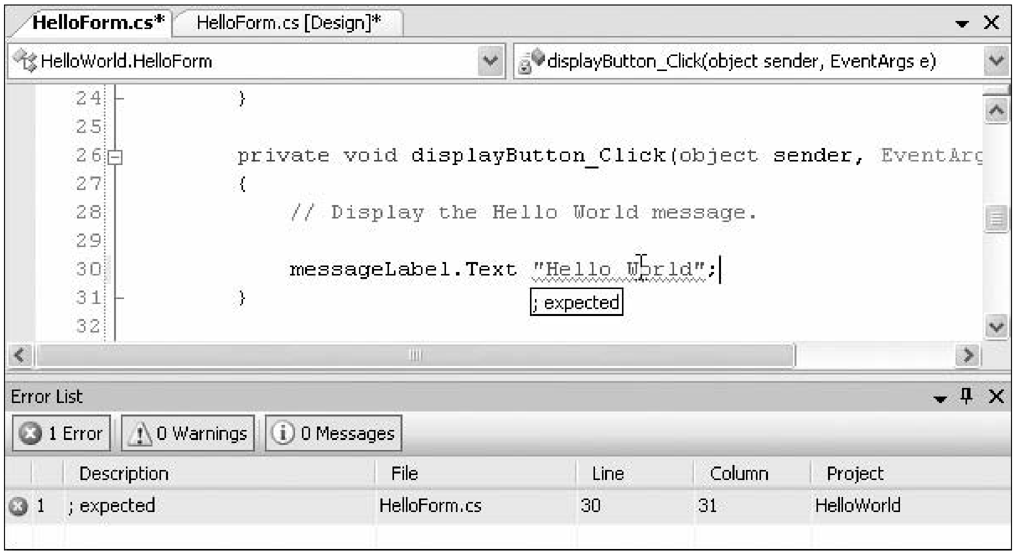
```
        }

        private void displayButton_Click(object sender, EventArgs e
        {
            // Display the Hello World message.

            messageLabel.Text "Hello World";
        }
```

; expected

(Figure 1.49) with *Tools / Options / Text Editor / C# / General / Display / Line Numbers.* You must select the *Show all settings* check box at the bottom left of the dialog box to select this option.

Figure 1.49

You can display the Error List window and line numbers in the source code to help locate the error lines.



```
24          }
25
26          private void displayButton_Click(object sender, EventArg
27          {
28              // Display the Hello World message.
29
30              messageLabel.Text "Hello World";
31          }
32
```

; expected

	Description	File	Line	Column	Project
1	; expected	HelloForm.cs	30	31	HelloWorld

The quickest way to jump to an error line is to point to a message in the Error List window and double-click. The line in error will display in the Editor window with the error highlighted (Figure 1.50).

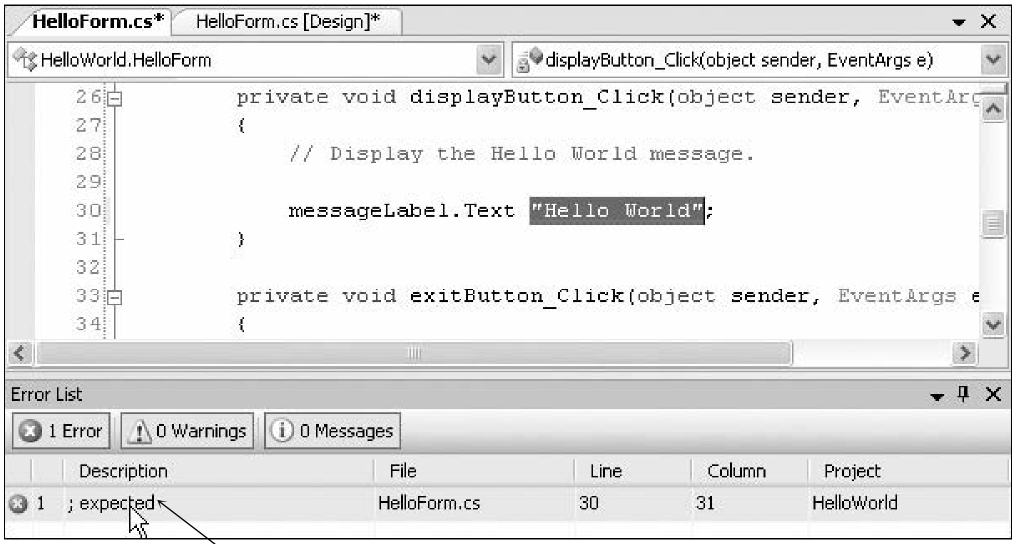
If a syntax error is found by the compiler, you will see the dialog box shown in Figure 1.51. Click *No* and return to the editor, correct your errors, and run the program again.

Run-Time Errors

If your project halts during execution, it is called a ***run-time error*** or an ***exception***. C# displays a dialog box and highlights the statement causing the problem.

Figure 1.50

Quickly jump to the line in error by double-clicking on the error message in the Error List window.



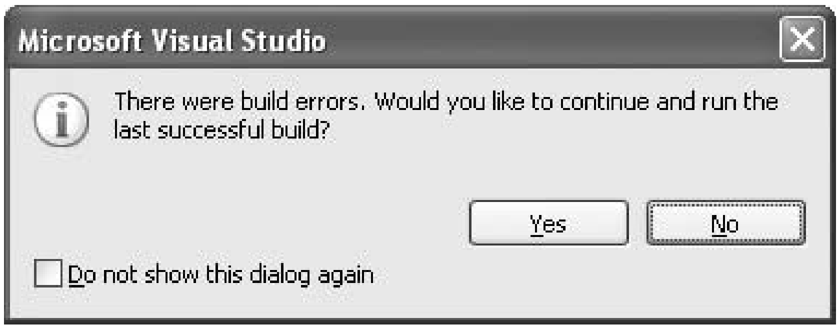
```
        private void displayButton_Click(object sender, EventArg
        {
            // Display the Hello World message.

            messageLabel.Text "Hello World";
        }

        private void exitButton_Click(object sender, EventArgs e
        {
```

	Description	File	Line	Column	Project
1	; expected	HelloForm.cs	30	31	HelloWorld

Double-click anywhere on this line to jump to the error

Figure 1.51

When the compiler identifies syntax errors, it cannot continue. Click No *to return to the editor and correct the error.*



There were build errors. Would you like to continue and run the last successful build?

Statements that cannot execute correctly cause run-time errors. The statements are correctly formed C# statements that pass the syntax checking; however, the statements fail to execute due to some serious issue. You can cause run-time errors by attempting to do impossible arithmetic operations, such as calculate with nonnumeric data, divide by zero, or find the square root of a negative number.

In Chapter 3 you will learn to catch exceptions so that the program does not come to a halt when an error occurs.

Logic Errors

When your program contains **logic errors**, the program runs but produces incorrect results. Perhaps the results of a calculation are incorrect or the wrong text appears or the text is okay but appears in the wrong location.

Beginning programmers often overlook their logic errors. If the project runs, it must be right—right? All too often, that statement is not correct. You may need to use a calculator to check the output. Check all aspects of the project output: computations, text, and spacing.

For example, the Hello World project in this chapter has event-handling methods for displaying “Hello World” in English and in Spanish. If the contents of the two methods were switched, the program would work, but the results would be incorrect.

The following code does not give the proper instructions to display the message in Spanish:

```
private void spanishButton_Click(object sender, EventArgs e)
{
    // Display the Hello World message in Spanish.

    messageLabel.Text = "Hello World";
}
```

Project Debugging

If you talk to any computer programmer, you will learn that programs don’t have errors—programs get “bugs” in them. Finding and fixing these bugs is called ***debugging***.

For syntax errors and run-time errors, your job is easier. C# displays the Editor window with the offending line highlighted. However, you must identify and locate logic errors yourself.

C# also includes a new-to-2005 feature: edit-and-continue. If you are able to identify the run-time error and fix it, you can continue project execution from that location by clicking on the *Run* button, pressing F5, or choosing *Debug / Continue*. You also can correct the error and restart from the beginning.

The Visual Studio IDE has some very helpful tools to aid in debugging your projects. The debugging tools are covered in Chapter 4.

TIP

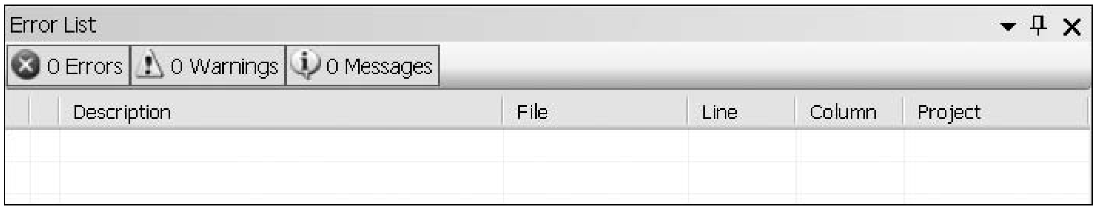
If you get the message “There were build errors. Continue?” always say *No*. If you say *Yes*, the last cleanly compiled version runs rather than the current version. ■

A Clean Compile

When you start executing your program, the first step is called *compiling*, which means that the C# statements are converted to Microsoft Intermediate Language (MSIL). Your goal is to have no errors during the compile process: a **clean compile**. Figure 1.52 shows the Error List window for a clean compile: 0 Errors; 0 Warnings; 0 Messages.

Figure 1.52

Zero errors, warnings, and messages means that you have a clean compile.



Modifying an Event Handler

When you double-click a Button control to begin writing an event-handling method for the Click event, several things happen. As an example, say that you have a button on your form called *button1*. If you double-click button1, the Editor window opens with a template for the new method:

```
private void button1_Click(object sender, EventArgs e)
{

}
```

The insertion point appears between the opening and closing braces, where you can begin typing your new method. But behind the scenes, VS also adds a line to the (hidden) *FormName*.Designer.cs file that assigns this new method to the Click event of the button.

As long as you keep the name of the button unchanged and don't delete the method, all is well. But if you want to rename the button, or perhaps delete the method (maybe you accidentally double-clicked a label or the form and have a method that you really don't want or need), then you will need to take additional steps.

Deleting a Method

Assume that you have double-clicked the form called Form1 and now have an extra method that you do not want. If you simply delete the method, your program generates an error message due to the extra code that appears in the Form's designer.cs file. When you double-click on the form, the extra Form Load event handler looks like this:

```
private void Form1_Load(object sender, EventArgs e)
{

}
```

If you delete these lines of code and try to run the program, you receive an error message that "'WindowsApplication1.Form1' does not contain a definition for 'Form1_Load'." If you double-click on the error message, it takes you to a line in the Form1.Designer.cs file. You can delete the line of code that it takes you to, which, in this example, is

```
this.Load += new System.EventHandler(this.Form1_Load);
```

Another way to remove the statement that assigns the event handler is to use the Properties window in the designer. First, make sure to select the form or control that has the unwanted event handler assigned, then click on the *Events* button in the Properties window (Figure 1.53). You will see the event-handling method's name for the name of the event. You can select and delete the name of the method, which removes the assignment statement from the Designer.cs file, and you will not generate an error message.

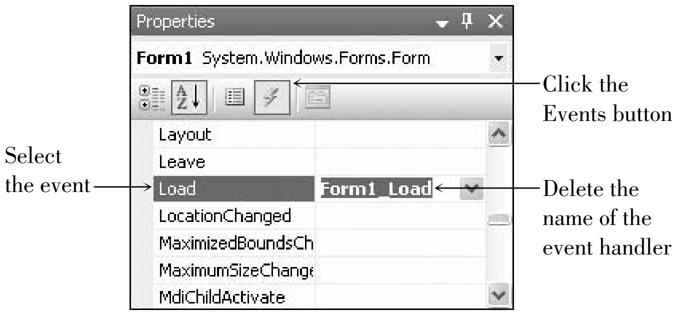


Figure 1.53

To remove the form's event handler, select the form and click on the Events button in the Properties window. Then delete the entry for the event handler—Form1_Load in this example.

Renaming a Control

You can receive an error if you rename a control after you write the code for its event. For this example, assume that you add a button that is originally called *button1*. You write the code for the button1_Click event handler and then decide to change the button's name to exitButton. (This scenario occurs quite often, especially with beginning programmers.)

If you simply change the Name property of button1 to exitButton in the form designer, your program will still run without an error message. But you may be surprised to see that the event handler is still named button1_Click. If you check the events in the Properties window, you will see why (Figure 1.54): Although the control was renamed, the event handler was not. And if you type a new name into the Properties window (exitButton_Click, for example), a new (empty) method template will appear in your code. The code that you wrote in the button1_Click method is still there and the new exitButton_Click method is empty. One solution is to just cut-and-paste the code from the old method to the new one. You can safely delete the empty button1_Click method since it no longer is assigned as the event handler.

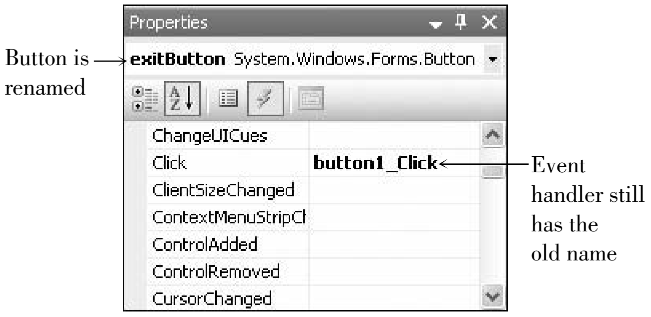


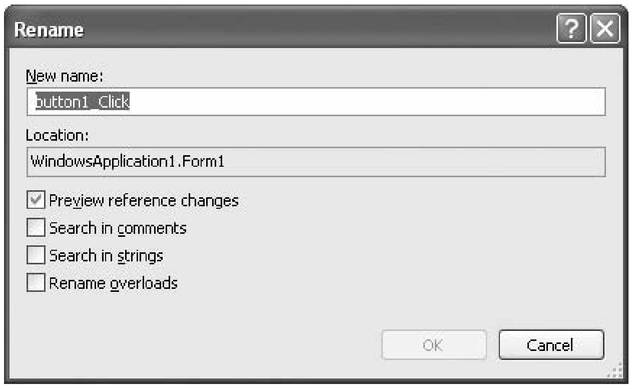
Figure 1.54

Even though you rename a control, the event handler is not renamed automatically.

Another way to change the name of an event handler is to use refactoring, which allows you to make changes to an existing object. After you change the name of the control using the designer, switch to the Editor window and right-click on the name of the event-handling method (button1_Click in this example). From the context menu, select *Refactor / Rename*. The *Rename* dialog box shows the current name of the method (Figure 1.55). Enter the new name, making sure to include the "_Click." When you click *OK*, all references to the old name are changed to the new one, which corrects the line in the Designer.cs file that assigns the event handler.

Figure 1.55

Change the name of the event-handling method using Refactor / Rename*, which changes the name of the method and the assignment of the event handler in the form's Designer.cs file.*



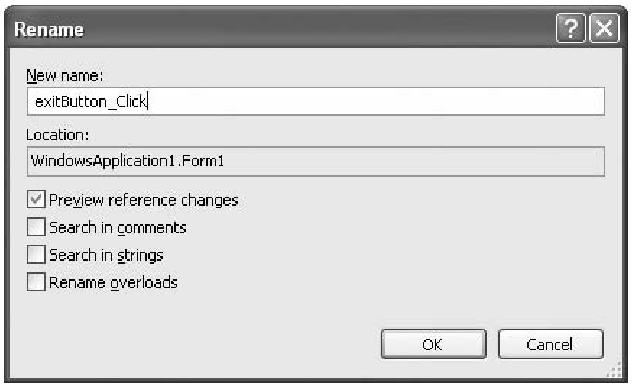
Rename

New name: button1_Click

Location: WindowsApplication1.Form1

☑ Preview reference changes
☐ Search in comments
☐ Search in strings
☐ Rename overloads

a.



Rename

New name: exitButton_Click

Location: WindowsApplication1.Form1

☑ Preview reference changes
☐ Search in comments
☐ Search in strings
☐ Rename overloads

b.

Naming Rules and Conventions for Objects

Using good consistent names for objects can make a project easier to read and understand, as well as easier to debug. You *must* follow the C# rules for naming objects, methods, and variables. In addition, conscientious programmers also follow certain naming conventions.

Most professional programming shops have a set of standards that their programmers must use. Those standards may differ from the ones you find in this book, but the most important point is this: *Good programmers follow standards. You should have a set of standards and always follow them.*

The Naming Rules

When you select a name for an object, C# requires the name to begin with a letter or an underscore. The name can contain letters, digits, and underscores. An object name cannot include a space or punctuation mark and cannot be a reserved word, such as button or Close, but can contain one. For example, exitButton and closeButton are legal. C# is case sensitive, so exitbutton, ExitButton, and exitButton refer to three different objects.

The Naming Conventions

This text follows standard naming conventions, which help make projects more understandable. When naming controls, use **camel casing**, which means that you begin the name with a lowercase character and capitalize each additional word in the name. Make up a meaningful name and append the full name of the control's class. Do not use abbreviations unless it is a commonly used term that everyone will understand. All names must be meaningful and indicate the purpose of the object.

Examples

messageLabel
exitButton
discountRateLabel

Do not keep the default names assigned by C#, such as button1 and label3. Also, do not name your objects with numbers. The exception to this rule is for labels that never change during program execution. These labels usually hold items such as titles, instructions, and labels for other controls. Leaving these labels with their default names is perfectly acceptable and is practiced in this text.

For forms and other classes, capitalize the first letter of the name and all other words within the name. You will find this style of capitalization referred to as **pascal casing** in the MSDN Help files. Always append the word *Form* to the end of a form name.

Examples

HelloForm
MainForm
AboutForm

Refer to Table 1.2 for sample object names.

Recommended Naming Conventions for C# Objects. **Table 1.2**

Object Class	Example
Form	DataEntryForm
Button	exitButton
Label	totalLabel
TextBox	paymentAmountTextBox
RadioButton	boldRadioButton
CheckBox	printSummaryCheckBox
PictureBox	landscapePictureBox
ComboBox	bookListComboBox
ListBox	ingredientsListBox
SoundPlayer	introPageSoundPlayer

Visual Studio Help

Visual Studio has an extensive Help facility, which contains much more information than you will ever use. You can look up any C# statement, class, property, method, or programming concept. Many coding examples are available, and you can copy and paste the examples into your own project, modifying them if you wish.

The VS Help facility includes all of the Microsoft Developer Network library (MSDN), which contains several books, technical articles, and the Microsoft Knowledge Base, a database of frequently asked questions and their answers. *MSDN includes reference materials for the VS IDE, the .NET Framework, C#, Visual Basic, J#, and C++. You will want to filter the information to display only the Visual C# and related information.*

Installing and Running MSDN

You can run MSDN from a hard drive, a network drive, or the Web. Of course, if you plan to access MSDN from the Web, you must have a live Internet connection as you work.

When you install Visual Studio, by default MSDN is installed on the hard drive. If you don't want to install it there, you must specifically choose this option. You can access MSDN on the Web at http://msdn.microsoft.com.

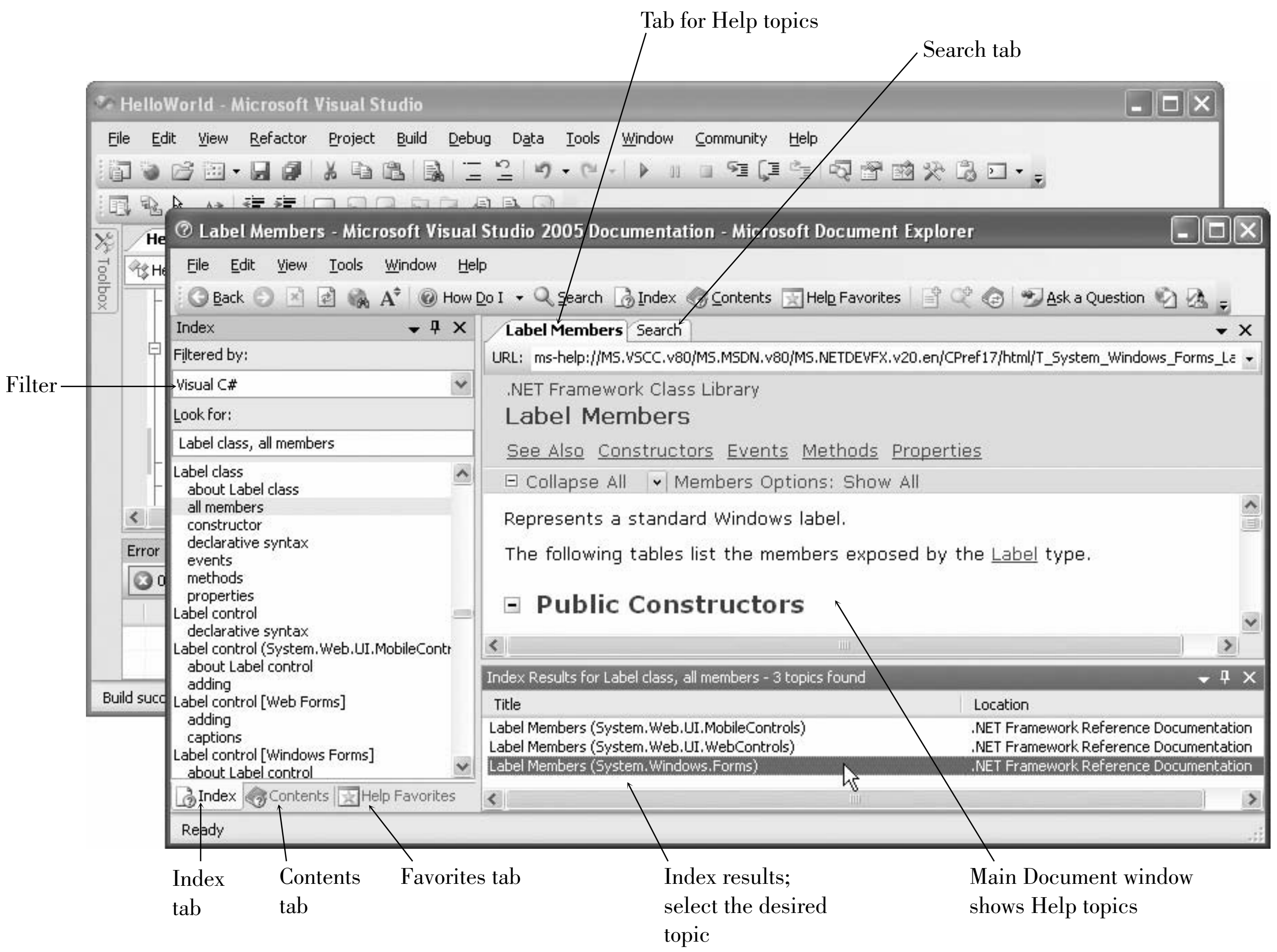
The extensive Help is a two-edged sword: You have available a wealth of materials, but it may take some time to find the topic you want.

Viewing Help Topics

The Help system display is greatly changed and improved in Visual Studio 2005. You view the Help topics in a separate window from the VS IDE, so you can have

Figure 1.56

The Help window. The Help topic and Search *appear in tabbed windows in the main Document window;* Index, Contents, *and* Help Favorites *appear in tabbed windows docked at the left of the main window.*


Tab for Help topics
Search tab
Filter
Index tab
Contents tab
Favorites tab
Index results; select the desired topic
Main Document window shows Help topics
HelloWorld - Microsoft Visual Studio
Label Members - Microsoft Visual Studio 2005 Documentation - Microsoft Document Explorer
Index
Filtered by:
Visual C#
Look for:
Label class, all members
Label Members
Search

URL: ms-help://MS.VSCC.v80/MS.MSDN.v80/MS.NETDEVFX.v20.en/CPref17/html/T_System_Windows_Forms_La

.NET Framework Class Library

Label Members

See Also Constructors Events Methods Properties

Represents a standard Windows label.

The following tables list the members exposed by the Label type.

Public Constructors

Index Results for Label class, all members - 3 topics found

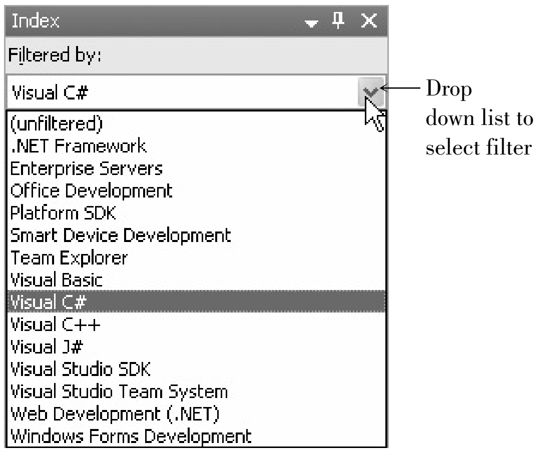
Title	Location
Label Members (System.Web.UI.MobileControls)	.NET Framework Reference Documentation
Label Members (System.Web.UI.WebControls)	.NET Framework Reference Documentation
Label Members (System.Windows.Forms)	.NET Framework Reference Documentation

both windows open at the same time. When you choose *How Do I*, *Search*, *Contents*, *Index*, or *Help Favorites* from the *Help* menu, a new window opens on top of the IDE window (Figure 1.56). You can switch from one window to the other, or resize the windows to view both on the screen if your screen is large enough.

You can choose to filter the Help topics so that you don't have to view topics for all of the languages when you search for a particular topic. In the Index or Contents window, drop down the *Filtered by* list and choose *Visual C#* (Figure 1.57).

Figure 1.57

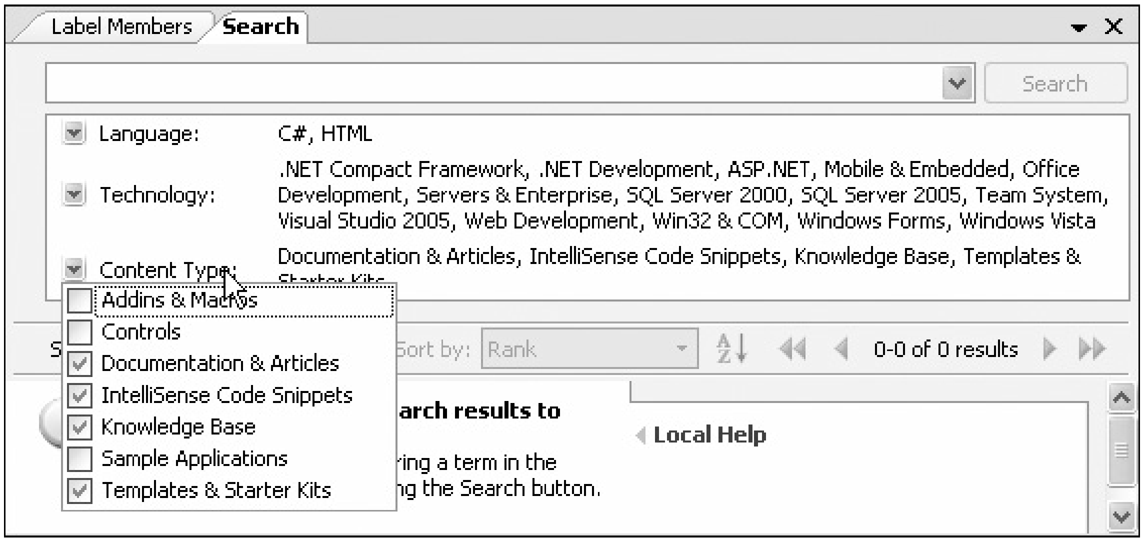
Filter the Help topics so that only the C# topics appear.



In the Search window, you can choose additional filter options, such as the technology and topic type. Drop down a list and select any desired options (Figure 1.58).

Figure 1.58

Drop down the Content Type list to make selections for the Search window.



Language: C#, HTML

Technology: .NET Compact Framework, .NET Development, ASP.NET, Mobile & Embedded, Office Development, Servers & Enterprise, SQL Server 2000, SQL Server 2005, Team System, Visual Studio 2005, Web Development, Win32 & COM, Windows Forms, Windows Vista

Content Type: Documentation & Articles, IntelliSense Code Snippets, Knowledge Base, Templates & Starter Kits

- [ ] Addins & Macros
- [ ] Controls
- [x] Documentation & Articles
- [x] IntelliSense Code Snippets
- [x] Knowledge Base
- [ ] Sample Applications
- [x] Templates & Starter Kits

In the Help Index window, you see main topics and subtopics (indented beneath the main topics). All main topics and some subtopics have multiple entries available. When you choose a topic that has more than one possible entry, the Index Results pane opens up below the main Document window (refer to Figure 1.56). Click on the entry for which you are searching and the corresponding page appears in the Document window. For most controls, such as the Label control that appears in Figure 1.56, you will find references for mobile controls, Web controls, and Windows Forms. For now, always choose Windows Forms. Chapters 1 to 8 deal with Windows Forms exclusively; Web Forms are introduced in Chapter 9.

A good way to start using Help is to view the topics that demonstrate how to look up topics in Help. On the Help *Contents* tab, select *Help on Help (Microsoft Document Explorer Help).* Then choose *Microsoft Document Explorer Overview* and *What's New in Document Exploration.* Make sure to visit *Managing Help Topics and Windows*, which has subtopics describing how to copy topics and print topics.

Context-Sensitive Help

A quick way to view Help on any topic is to use **context-sensitive Help**. Select a C# object, such as a form or a control, or place the insertion point in a word in the editor and press F1. The Help window pops up with the corresponding Help topic displayed, if possible, saving you a search. You can display context-sensitive Help about the environment by clicking in an area of the screen and pressing Shift + F1.

Managing Windows

At times you may have more windows and tabs open than you want. You can hide or close any window, or switch to a different window.

- To close a window that is a part of a tabbed window, click the window's *Close* button. Only the top window will close.
- To switch to another window that is part of a tabbed window, click on its tab.

For additional help with the environment, see Appendix C, "Tips and Shortcuts for Mastering the Visual Studio Environment."

Feedback 1.1

Note: Answers for Feedback questions appear in Appendix A.

1. Display the Help Index, filter by *Visual C#*, and type "button control." In the Index list, notice multiple entries for button controls, including HTML, Web Forms, and Windows Forms. Click on the main topic, *Button control (Windows Forms)*: a small window pops up with multiple subtopics for the selected entry (you may need to enlarge the window). Double-click on *Introduction to the Windows Forms Button Control* and the topic displays in the Document window. Notice that additional links appear in the text in the Document window. You can click on a link to view another topic.
2. Display the Editor window of your Hello World project. Click on the `Close` method to place the insertion point. Press the F1 key to view context-sensitive Help.
3. Select each of the options from the VS IDE's *Help* menu to see how they respond.

Your Hands-On Programming Example

Write a program for the Look Sharp Fitness Center to display the current promotional packages. Include a label for the current special and buttons for each of the following departments: Clothing, Equipment and Accessories, Juice Bar, Membership, and Personal Training.

The user interface should also have an exit button and a label with the programmer's name. Use appropriate names for all controls. Make sure to change the Text property of the form.

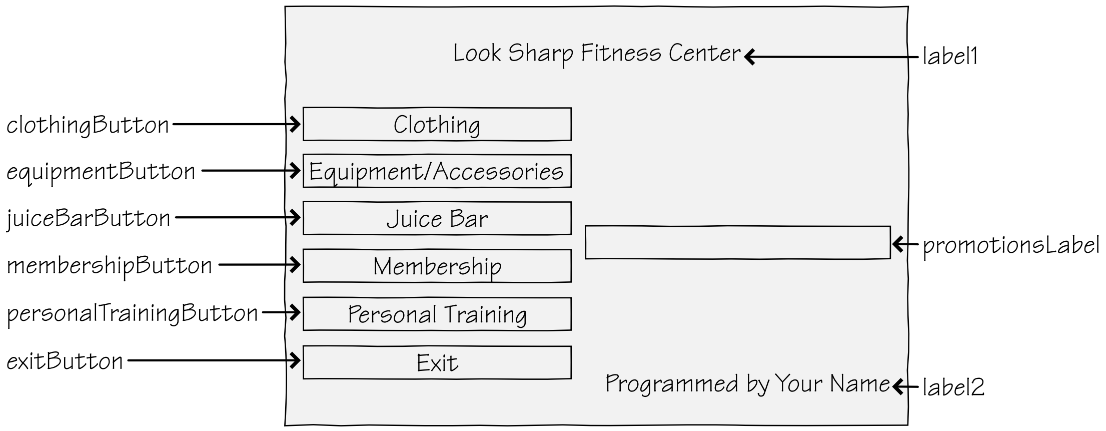
Planning the Project

Sketch a form (Figure 1.59), which your users sign off as meeting their needs.

Note: Although this step may seem unnecessary, having your users sign off is standard programming practice and documents that your users have been involved and have approved the design.

Figure 1.59

A planning sketch of the form for the hands-on programming example.



Plan the Objects and Properties

Plan the property settings for the form and for each control.

Object	Property	Setting	
PromotionForm	Name	PromotionForm	
	Text	Current Promotions	
	StartPosition	CenterScreen	
label1	Text	Look Sharp Fitness Center	Hint: Do not change the name of this label.
	Font	18 pt.	
label2	Text	Your name	

Object	Property	Setting
promotionsLabel	Name	promotionsLabel
	AutoSize	True
	Text	(blank)
	TextAlign	MiddleLeft
	Font	12 pt.
clothingButton	Name	clothingButton
	Text	Clothing
equipmentButton	Name	equipmentButton
	Text	Equipment/Accessories
juiceBarButton	Name	juiceBarButton
	Text	Juice Bar
membershipButton	Name	membershipButton
	Text	Membership
personalTrainingButton	Name	personalTrainingButton
	Text	Personal Training
exitButton	Name	exitButton
	Text	Exit

Plan the Event Methods You will need event-handling methods for each button.

Method	Actions—Pseudocode
clothingButton_Click	Display "Take an extra 30% off the clearance items." in the label.
equipmentButton_Click	Display "Yoga mats––25% off."
juiceBarButton_Click	Display "Try a free serving of our new WheatBerry Shake."
membershipButton_Click	Display "First month personal training included."
personalTrainingButton_Click	Display "3 free sessions with membership renewal."
exitButton_Click	End the project.

Write the Project Follow the sketch in Figure 1.59 to create the form. Figure 1.60 shows the completed form.

- Set the properties of each object, as you have planned.
- Working from the pseudocode, write each event-handling method.
- When you complete the code, thoroughly test the project.

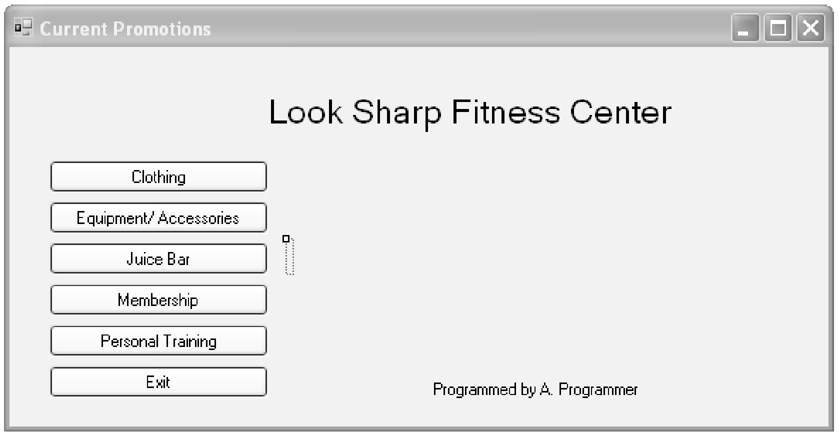


Figure 1.60

The form for the hands-on programming example.

The Project Coding Solution

```
/*
 * Project:      Ch01HandsOn
 * Programmer:   Bradley/Millspaugh
 * Date:         Jan 2007
 * Description:  This project displays current sales for
 *               each department.
 */

using System;
using System.Collections.Generic;
using System.ComponentModel;
using System.Data;
using System.Drawing;
using System.Text;
using System.Windows.Forms;

namespace Ch01HandsOn
{
    public partial class PromotionsForm : Form
    {
        public Form1()
        {
            InitializeComponent();
        }

        private void exitButton_Click(object sender, EventArgs e)
        {
            // End the project.

            this.Close();
        }

        private void clothingButton_Click(object sender, EventArgs e)
        {
            // Display current promotion.

            promotionsLabel.Text = "Take an extra 30% off the clearance items.";
        }
        private void equipmentLabel_Click(object sender, EventArgs e)
        {
            // Display current promotion.

            promotionsLabel.Text = "Yoga mats--25% off.";
        }

        private void juiceBarButton_Click(object sender, EventArgs e)
        {
            // Display current promotion.

            promotionsLabel.Text = "Try a free serving of our new WheatBerry Shake.";
        }

        private void membershipButton_Click(object sender, EventArgs e)
        {
            // Display current promotion.

            promotionsLabel.Text = "First month personal training included.";
        }

        private void personalTrainingButton_Click(object sender, EventArgs e)
        {
            // Display current promotion.

            promotionsLabel.Text = "3 free sessions with membership renewal.";
        }
    }
}
```

Summary

1. Visual C# is an object-oriented language used to write application programs that run in Windows or on the Internet using a graphical user interface (GUI).
2. In the OOP object model, classes are used to create objects that have properties, methods, and events.
3. The current release of C# is called Visual C# 2005 and is one part of Visual Studio. C# is available individually in an Express Edition and a Standard Edition, or in Visual Studio Professional Edition and Team System version.
4. The .NET Framework provides an environment for the objects from many languages to interoperate. Each language compiles to Microsoft Intermediate Language (MSIL) and runs in the Common Language Runtime (CLR).
5. To plan a project, first sketch the user interface and then list the objects and properties needed. Then plan the necessary event-handling methods.
6. The three steps to creating a C# project are (1) define the user interface, (2) set the properties, and (3) write the code.
7. A C# application is called a *solution*. Each solution may contain multiple projects, and each project may contain multiple forms and additional files. The solution file has an extension of .sln, a project file has an extension of .csproj, and form files and additional C# files have an extension of .cs. In addition, the Visual Studio environment and the C# compiler both create several more files.
8. The Visual Studio integrated development environment (IDE) consists of several tools, including a form designer, an editor, a compiler, a debugger, an object browser, and a Help facility.

9. C# has three modes: design time, run time, and debug time.
10. You can customize the Visual Studio IDE and reset all customizations back to their default state.
11. You create the user interface for an application by adding controls from the toolbox to a form. You can move, resize, and delete the controls.
12. The Name property of a control is used to refer to the control in code. The Text property holds the words that the user sees on the screen.
13. C# code is written in methods. Methods begin and end with braces { }.
14. Project comments are used for documentation. Good programming practice requires comments in every method and at the top of a file.
15. Most C# statements must be terminated by a semicolon. A statement may appear on multiple lines; the semicolon determines the end of the statement. Comments and some other statements do not end with semicolons.
16. Assignment statements assign a value to a property or a variable. Assignment statements work from right to left, assigning the value on the right side of the equal sign to the property or variable named on the left side of the equal sign.
17. The `this.Close()` method terminates program execution.
18. Each event to which you want to respond requires an event-handling method, also called an *event handler*.
19. You can print out the C# code for documentation.
20. Three types of errors can occur in a C# project: syntax errors, which violate the syntax rules of the C# language; run-time errors, which contain a statement that cannot execute properly; and logic errors, which produce erroneous results.
21. Finding and fixing program errors is called *debugging*.
22. You must have a clean compile before you run the program.
23. Following good naming conventions can help make a project easier to debug.
24. C# Help has very complete descriptions of all project elements and their uses. You can use the *How Do I*, *Contents*, *Index*, *Search*, or context-sensitive Help.

Key Terms

assignment statement *28*	event *4*
Button *18*	event handler *28*
camel casing *50*	event-handling method *28*
class *4*	Form *2*
clean compile *47*	Form Designer *12*
code *6*	graphical user interface (GUI) *2*
comment *28*	Help *12*
context menu *23*	integrated development environment (IDE) *7*
context-sensitive Help *54*	Label *18*
control *3*	logic error *46*
debug time *14*	method *4*
debugging *47*	namespace *21*
design time *14*	object *4*
Document window *12*	object-oriented programming (OOP) *3*
exception *45*	
Express Edition *5*	

Review Questions

1. What are objects and properties? How are they related to each other?
2. What are the three steps for planning and creating C# projects? Describe what happens in each step.
3. What is the purpose of these C# file types: .sln, .suo, and .cs?
4. When is C# in design time? run time? debug time?
5. What is the purpose of the Name property of a control?
6. Which property determines what appears on the form for a Label control?
7. What is the purpose of the Text property of a button? The Text property of a form?
8. What does displayButton_Click mean? To what does displayButton refer? To what does Click refer?
9. What is a C# event? Give some examples of events.
10. What property must be set to center text in a label? What should be the value of the property?
11. Describe the two types of comments in a C# program and tell where each is generally used.
12. What is meant by the term *debugging*?
13. What is a syntax error, when does it occur, and what might cause it?
14. What is a run-time error, when does it occur, and what might cause it?
15. What is a logic error, when does it occur, and what might cause it?
16. Tell the class of control and the likely purpose of each of these object names:
    addressLabel
    exitButton
    nameTextBox
17. What does context-sensitive Help mean? How can you use it to see the Help page for a button?

Programming Exercises

1.1 For your first C# exercise, you must first complete the Hello World project. Then add buttons and event-handling methods to display the "Hello World" message in two more languages. You may substitute any other languages for those shown. Feel free to modify the user interface to suit yourself (or your instructor).

Make sure to use meaningful names for your new buttons, following the naming conventions in Table 1.2. Include comments at the top of every method and at the top of the file.

"Hello World" in French:	Bonjour tout le monde
"Hello World" in Italian:	Ciao Mondo

1.2 Create a project that displays the hours for each department on campus. Include buttons for Student Learning, Financial Aid, Counseling, and the Bookstore. Each button should display the hours for that department in a label. The interface should have one label for the hours, one label for the programmer name, buttons for each department, and an exit button.

Make sure to use meaningful names for your new buttons, following the naming conventions in Table 1.2. Include comments at the top of every method and at the top of the file.

1.3 Write a project that displays four sayings, such as "The early bird gets the worm" or "A penny saved is a penny earned." (You will want to keep the sayings short, as each must be entered on one line. However, when the saying displays on your form, you can set the label's properties to allow long lines to wrap within the label.)

Make a button for each saying with a descriptive Text property for each, as well as a button to exit the project.

Include a label that holds your name at the bottom of the form. Also, make sure to change the form's title bar to something meaningful.

If your sayings are too long to display on one line, set the label's AutoSize property to False and resize the height of the label to hold multiple lines. You may change the Font properties of the label to the font and size of your choice.

Make sure the buttons are large enough to hold their entire Text properties.

Follow good naming conventions for object names; include comments at the top of every method and at the top of the file.

1.4 Write a project to display company contact information. Include buttons and labels for the contact person, department, and phone. When the user clicks on one of the buttons, display the contact information in the corresponding label. Include a button to exit.

Include a label that holds your name at the bottom of the form and change the title bar of the form to something meaningful.

You may change the Font properties of the labels to the font and size of your choice.

Follow good naming conventions for object names; include comments at the top of every method and at the top of the file.

1.5 Create a project to display the daily specials for "your" diner. Make up a name for your diner and display it in a label at the top of the form. Add a label to display the appropriate special depending on the button that is pressed. The buttons should be

- Soup of the Day
- Chef's Special
- Daily Fish

Also include an Exit button.

Sample Data: Dorothy's Diner is offering Tortilla Soup, a California Cobb Salad, and Hazelnut-Coated Mahi Mahi.

Case Studies

Custom Supplies Mail Order

If you don't have the time to look for all those hard-to-find items, tell us what you're looking for. We'll send you a catalog from the appropriate company or order for you.

We can place an order and ship it to you. We also help with shopping for gifts; your order can be gift wrapped and sent anywhere you wish.

The company title will be shortened to CS Mail Order. Include this name on the title bar of the first form of each project that you create for this case study.

Your first job is to create a project that will display the name and telephone number for the contact person for the customer relations, marketing, order processing, and shipping departments.

Include a button for each department. When the user clicks on the button for a department, display the name and telephone number for the contact person in two labels. Also include identifying labels with Text "Department Contact" and "Telephone Number."

Be sure to include a button for Exit.

Include a label at the bottom of the form that holds your name and give the form a meaningful title bar.

Test Data

Department	**Department Contact**	**Telephone Number**
Customer Relations	Tricia Mills	500-1111
Marketing	Michelle Rigner	500-2222
Order Processing	Kenna DeVoss	500-3333
Shipping	Eric Andrews	500-4444

Christopher's Car Center

Christopher's Car Center will meet all of your automobile needs. The center has facilities with everything for your vehicles including sales and leasing for new and used cars and RVs, auto service and repair, detail shop, car wash, and auto parts.

Your first job is to create a project that will display current notices.

Include four buttons labeled "Auto Sales," "Service Center," "Detail Shop," and "Employment Opportunities." One label will be used to display the information when the buttons are clicked. Be sure to include a button for Exit.

Include your name in a label at the bottom of the form.

Test Data

Button	**Label Text**
Auto Sales	Family wagon, immaculate condition $12,995
Service Center	Lube, oil, filter $25.99
Detail Shop	Complete detail $79.95 for most cars
Employment Opportunities	Sales position, contact Mr. Mann 551-2134 x475

Xtreme Cinema

This neighborhood store is an independently owned video rental business. The owners would like to allow their customers to use the computer to look up the aisle number for movies by category.

Create a form with a button for each category. When the user clicks on a button, display the corresponding aisle number in a label. Include a button to exit.

Include a label that holds your name at the bottom of the form and change the title bar of the form to Xtreme Cinema.

You may change the font properties of the labels to the font and size of your choice. Include additional categories, if you wish.

Follow good programming conventions for object names; include comments at the top of every method and at the top of the file.

Test Data

Button	Location
Comedy	Aisle 1
Drama	Aisle 2
Action	Aisle 3
Sci-Fi	Aisle 4
Horror	Aisle 5
New Releases	Back Wall

Cool Boards

This chain of stores features a full line of clothing and equipment for snowboard and skateboard enthusiasts. Management wants a computer application to allow their employees to display the address and hours for each of their branches.

Create a form with a button for each store branch. When the user clicks on a button, display the correct address and hours.

Include a label that holds your name at the bottom of the form and change the title bar of the form to Cool Boards.

You may change the font properties of the labels to the font and size of your choice.

Follow good programming conventions for object names; include comments at the top of every method and at the top of the file.

Store Branches: The three branches are Downtown, Mall, and Suburbs. Make up hours and locations for each.