ASP.NET Web Pages Using the Razor Syntax

Microsoft® ASP.NET Web Pages is a free Web development technology that is designed to deliver the world's best experience for Web developers who are building websites for the Internet. This book provides an overview of how to create dynamic Web content using ASP.NET Web Pages with the Razor syntax.

Last update: 20 May 2011

> **Note** To get the complete sample code for this book, go to the Microsoft Download Center.

Contents

Chapter 1 – Getting Started with WebMatrix and ASP.NET Web Pages

This chapter introduces Microsoft WebMatrix, a free web development technology that delivers the world's best experience for web developers.

What you'll learn

- What is WebMatrix?
- How to install WebMatrix.
- How to get started creating a simple website using WebMatrix.
- How to create a dynamic web page using WebMatrix.
- How to program your web pages in Visual Studio to take advantage of more advanced features.

What is WebMatrix?

WebMatrix is a free, lightweight set of web development tools that provides the easiest way to build websites. It includes IIS Express (a development web server), ASP.NET (a web framework), and SQL Server Compact (an embedded database). It also includes a simple tool that streamlines website development and makes it easy to start websites from popular open source apps. The skills and code you develop with WebMatrix transition seamlessly to Visual Studio and SQL Server.

The web pages that you create using WebMatrix can be dynamic—that is, they can alter their content or style based on user input or on other information, such as database information. To program dynamic Web pages, you use ASP.NET with the Razor syntax and with the C# or Visual Basic programming languages.

If you already have programming tools that you like, you can try the WebMatrix tools or you can use your own tools to create websites that use ASP.NET.

This chapter shows you how WebMatrix makes it easy to get started creating websites and dynamic web pages.

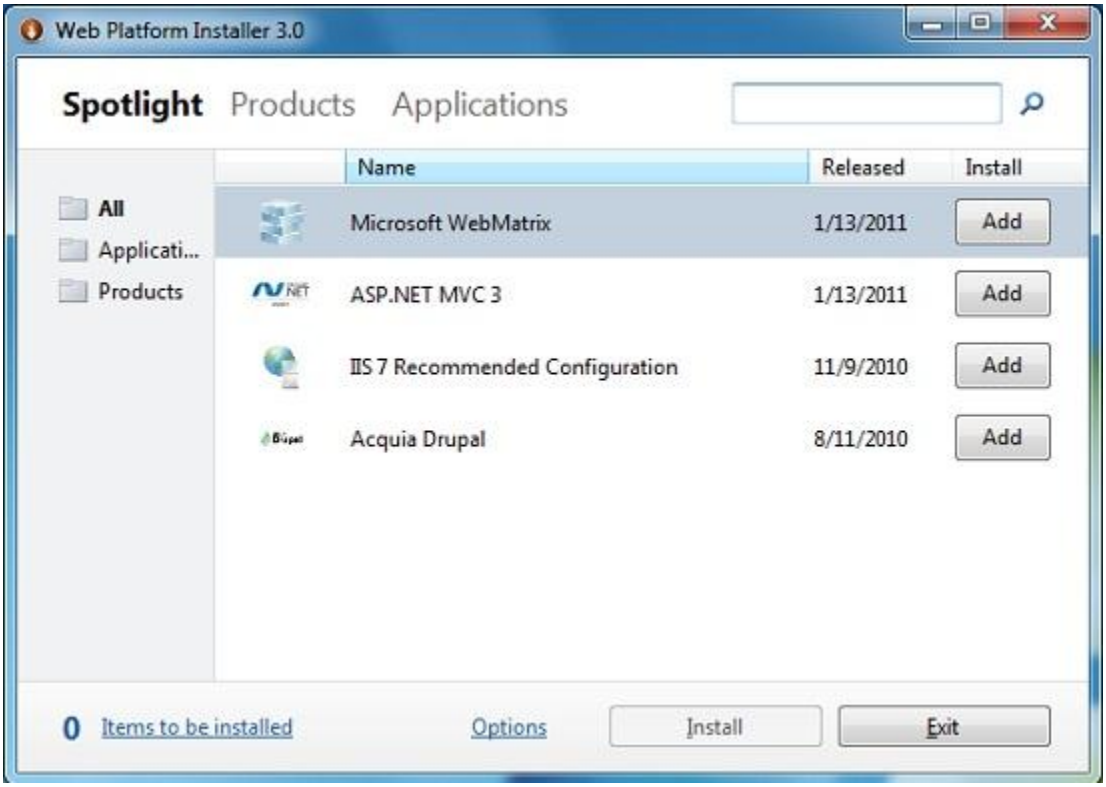
Installing WebMatrix

To install WebMatrix, you can use Microsoft's Web Platform Installer, which is a free application that makes it easy to install and configure web-related technologies.

1. If you don't already have the Web Platform Installer, download it from the following URL:

   http://go.microsoft.com/fwlink/?LinkID=205867

2. Run the Web Platform Installer, select **Spotlight**, and then click **Add** to install WebMatrix.



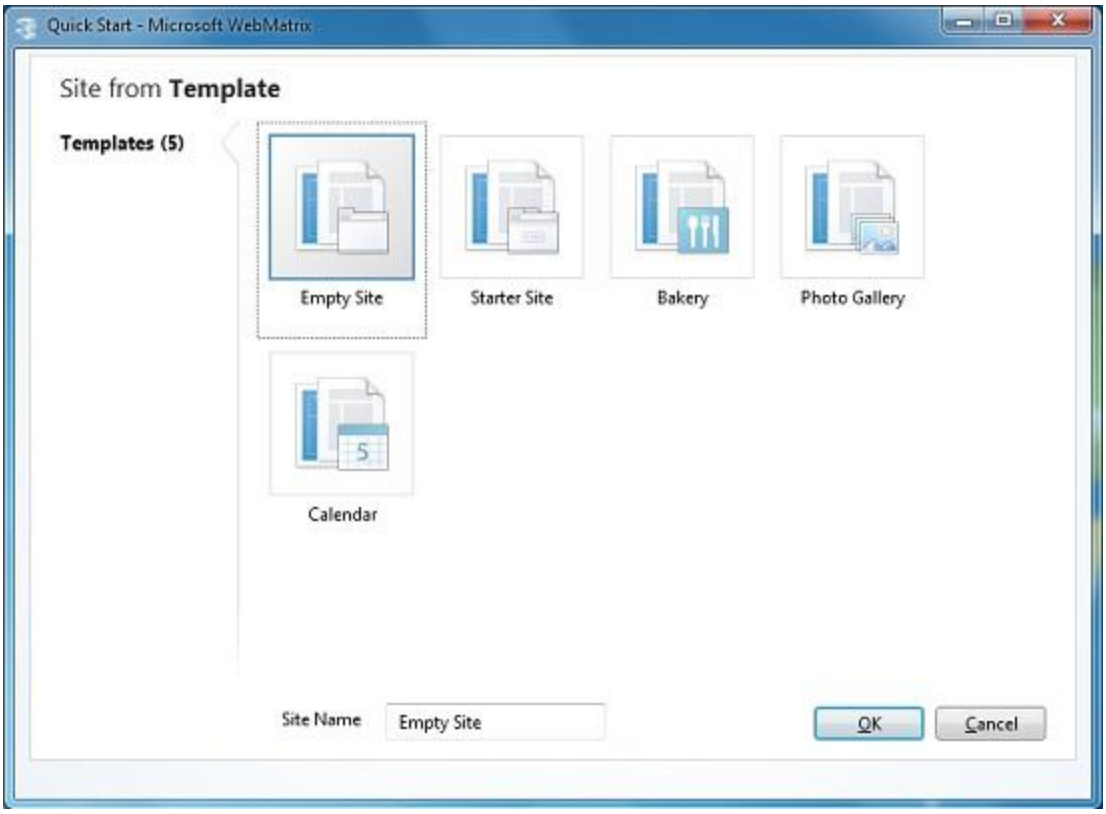
Note If you already have a WebMatrix Beta version installed, the Web Platform Installer upgrades the installation to WebMatrix 1.0. However, sites you created with earlier Beta editions might not appear in the **My Sites** list when you first open WebMatrix. To open a previously created site, click the **Site From Folder** icon, browse to the site, and open it. The next time you open WebMatrix, the site will appear in the **My Sites** list.

Getting Started with WebMatrix

To begin, you'll create a new website and a simple web page.

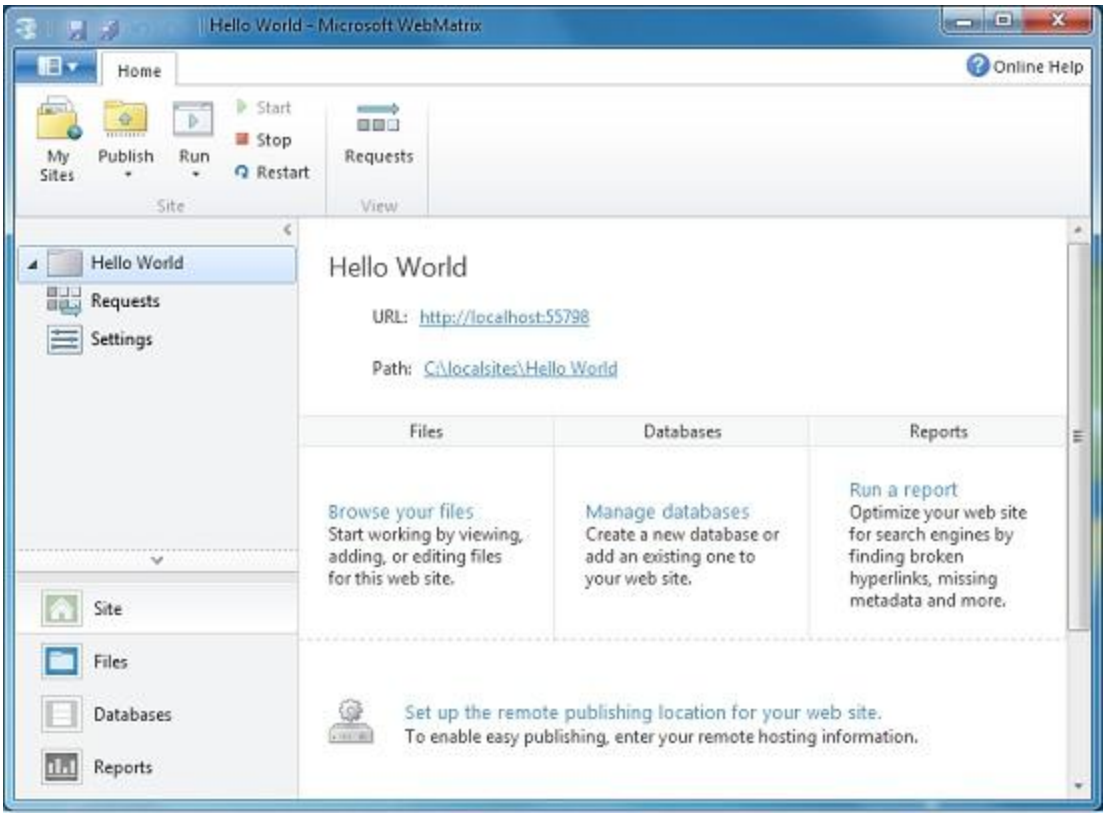
1. Start WebMatrix.

2. Click **Site From Template**. Templates include prebuilt files and pages for different types of websites.



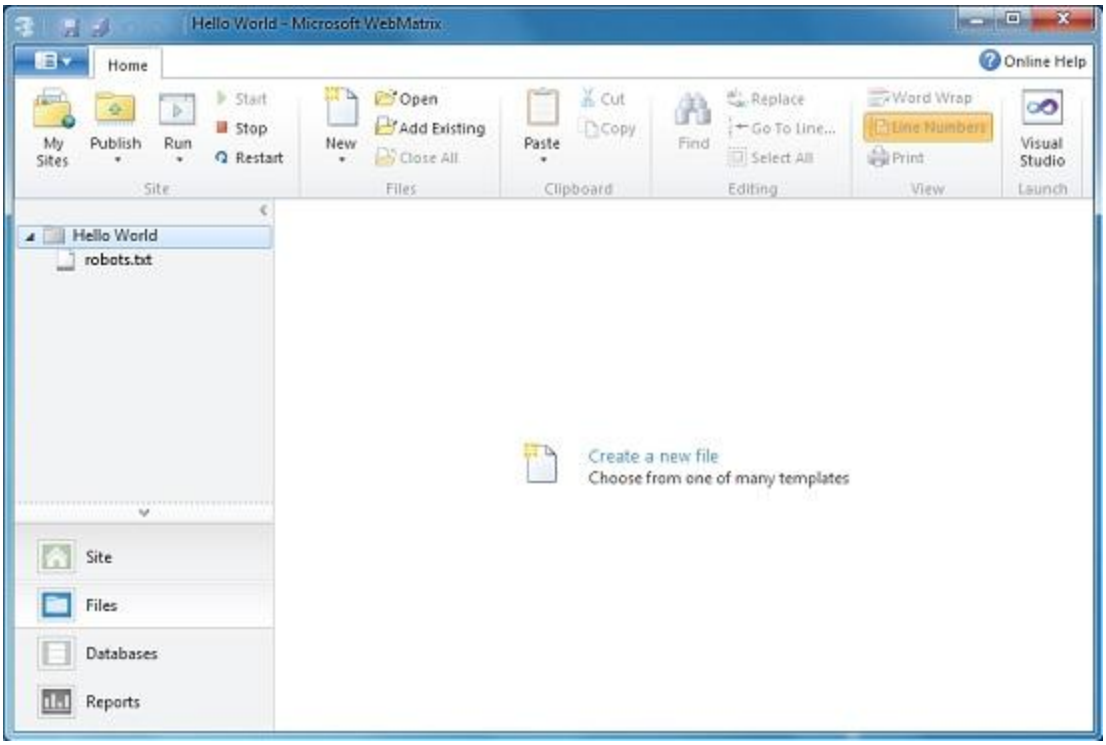
3. Select **Empty Site** and name the new site *Hello World*.
4. Click **OK**. WebMatrix creates and opens the new site.

   At the top, you see a Quick Access Toolbar and a ribbon, as in Microsoft Office 2010. At the bottom left, you see the workspace selector, which contains buttons that determine what appears above them in the left pane. On the right is the content pane, which is where you view reports, edit files, and so on. Finally, across the bottom is the notification bar, which displays messages as needed.

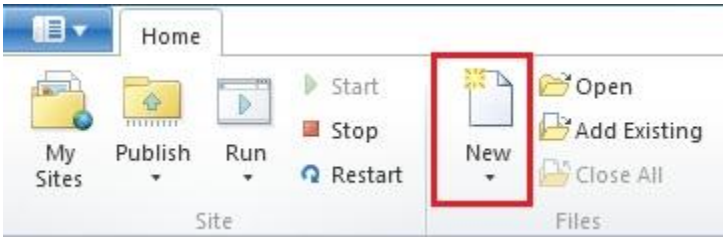


Creating a Web Page

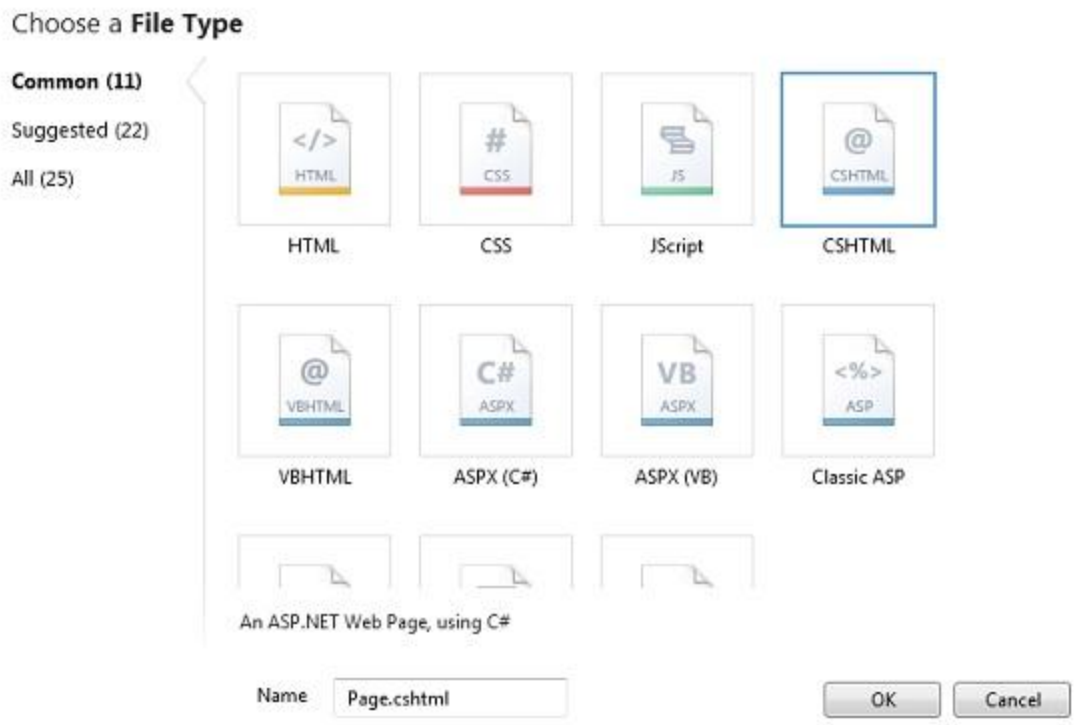
1. In WebMatrix, select the **Files** workspace. This workspace lets you work with files and folders. The left pane shows the file structure of your site.



2. In the ribbon, click **New** and then click **New File**.



WebMatrix displays a list of file types.



3. Select **CSHTML**, and in the **Name** box, type *default.cshtml*. A CSHTML page is a special type of page in WebMatrix that can contain the usual contents of a web page, such as HTML and JavaScript code, and that can also contain code for programming web pages. (You'll learn more about CSHTML files later.)
4. Click **OK**. WebMatrix creates the page and opens it in the editor.

As you can see, this is ordinary HTML markup.

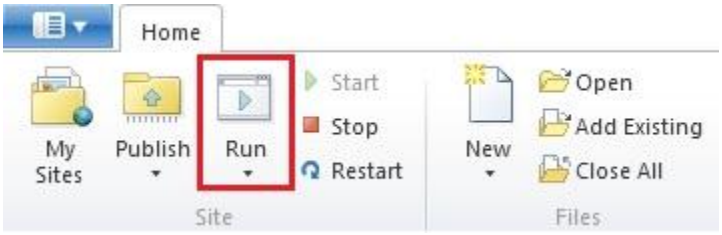
5. Add the following title, heading, and paragraph content to the page:

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8" />
        <title>Hello World Page</title>
```

```
    </head>
    <body>
    <h1>Hello World Page</h1>
    <p>Hello World!</p>
    </body>
</html>
```

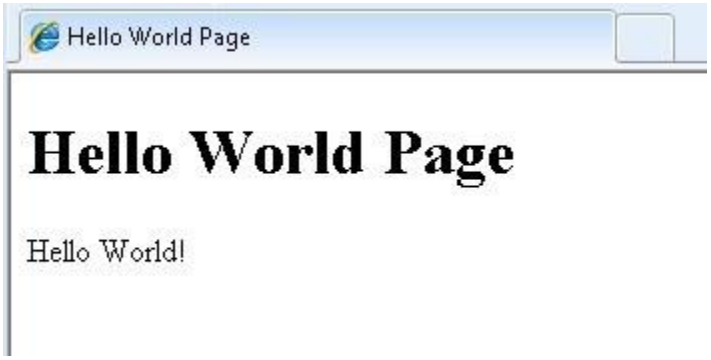
6. In the Quick Access Toolbar, click **Save**.

7. In the ribbon, click **Run**.



Note Before you click **Run**, make sure that the web page you want to run is selected in the navigation pane of the **Files** workspace. WebMatrix runs the page that's selected, even if you're currently editing a different page. If no page is selected, WebMatrix tries to run the default page for the site (*default.cshtml*), and if there is no default page, the browser displays an error.

WebMatrix starts a web server (IIS Express) that you can use to test pages on your computer. The page is displayed in your default browser.

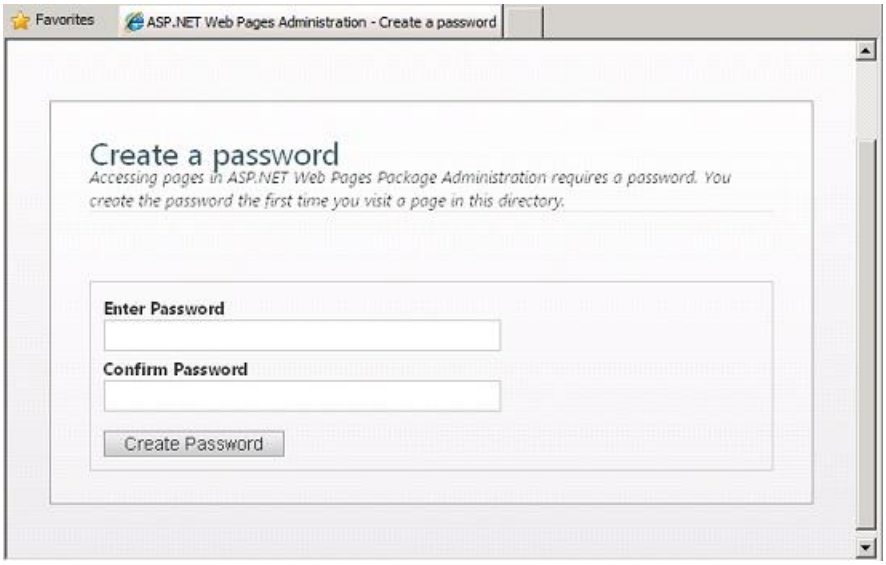


Installing Helpers with the Administration Tool

Now that you have WebMatrix installed and a site created, it's a good idea learn how to use the ASP.NET Web Pages Administration tool and the Package Manager to install helpers. WebMatrix contains helpers (components) that simplify common programming tasks and that you'll use throughout these tutorials. (Some helpers are already included with WebMatrix, but you can install others as well.) In the appendix

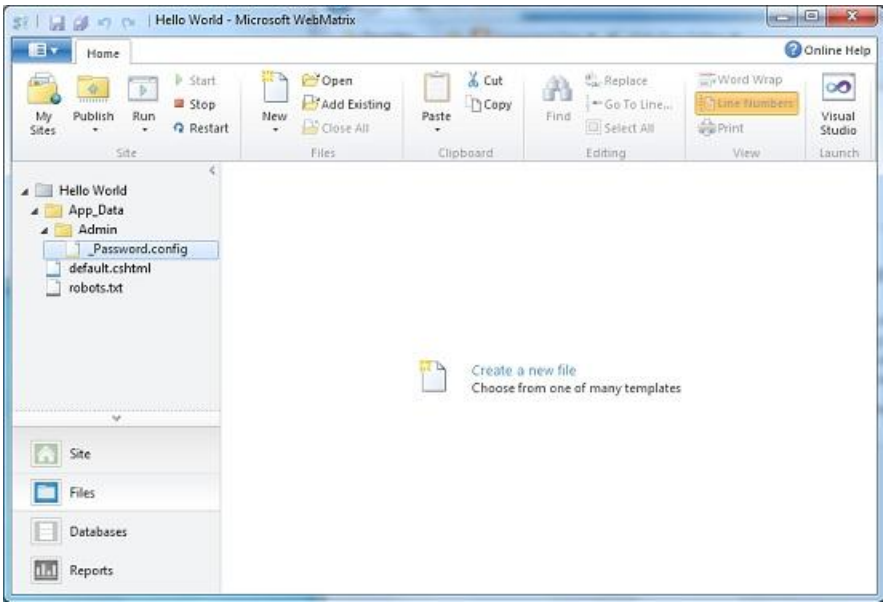
you can find a quick reference for the included helpers and for other helpers that you can install as part of a package called the ASP.NET Web Helpers Library. The following procedure shows how to use the Administration tool to install the ASP.NET Web Helpers Library. You will use some of these helpers in this tutorial and other tutorials in this series.

1. In WebMatrix, click the **Site** workspace.
2. In the content pane, click **ASP.NET Web Pages Administration**. This loads an administration page into your browser. Because this is the first time you're logging into the administration page, it prompts you to create a password.
3. Create a password.

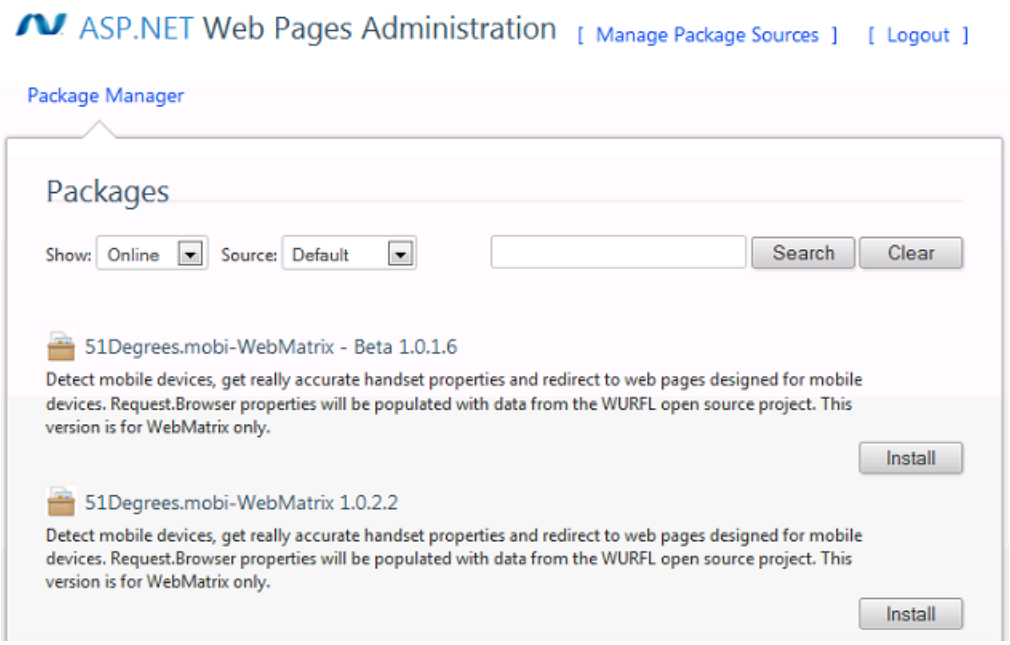


After you click **Create Password**, a security-check page that looks like the following screen shot prompts you to rename the password file for security reasons. If this is the first time you're seeing this page, don't try to rename the file yet. Proceed to the next step and follow the directions there.

4. Leave the browser open on the security-check page, return to WebMatrix, and click the **Files** workspace.
5. Right-click the *Hello World* folder for your site and then click **Refresh**. The list of files and folders now displays an *App_Data* folder. Open that and you see an *Admin* folder. The newly created password file (*_Password.config*) is displayed in the *./App_Data/Admin/* folder. The following illustration shows the updated file structure with the password file selected:

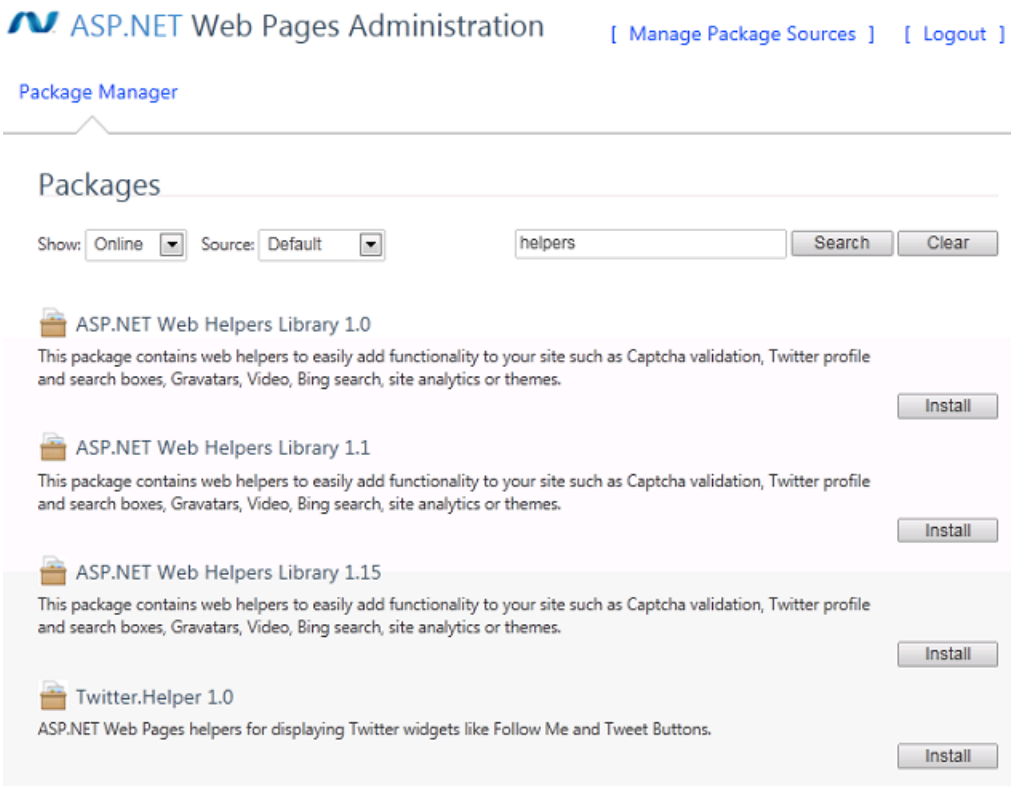


6. Rename the file to *Password.config* by removing the leading underscore (_) character.
7. Return to the security-check page in the browser, and click the **Click Here** link near the end of the message about renaming the password file.
8. Log into the Administration page using the password you created. The page displays the Package Manager, which contains a list of add-on packages.

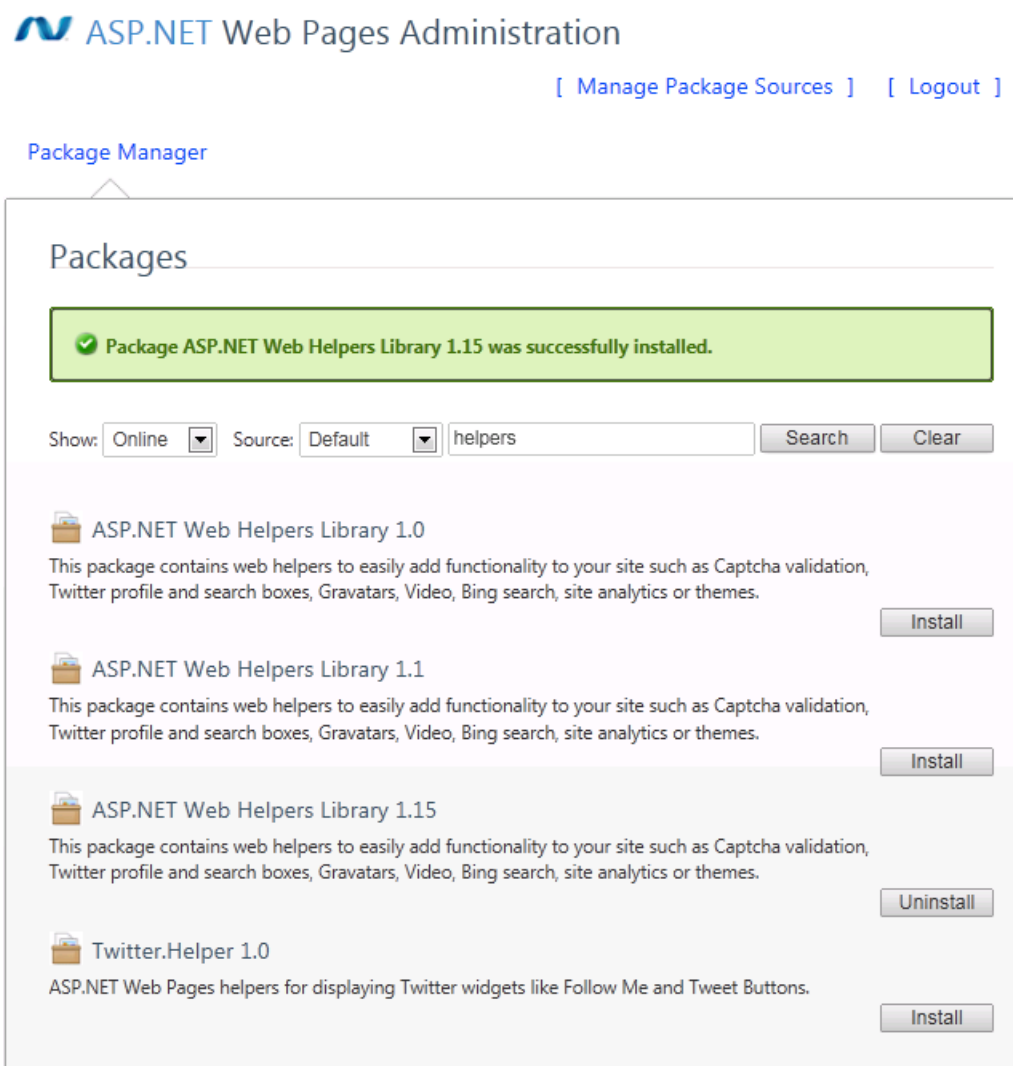


If you ever want to display other feed locations, click the **Manage Package Sources** link to add, change, or remove feeds.

9. Find the ASP.NET Web Helpers Library package. To narrow down the list, search for *helpers* using the **Search** field. The following image shows the result of searching for *helpers*. Notice that several versions of this package are available.



10. Select the version that you want, click the **Install** button, and then install the package as directed. After the package is installed, the Package Manager displays the result.



This page also lets you uninstall packages, and you can use the page to update packages when newer versions are available. You can go to the **Show** drop-down list and click **Installed** to display the packages you have installed, or click **Updates** to display available updates for the installed packages.

> **Note** The default website templates (**Bakery**, **Calendar**, **Photo Gallery**, and **Starter Site**) are available in C# and Visual Basic versions. You can install the Visual Basic templates by using the **ASP.NET Web Pages Administration** tool in WebMatrix. Open the Administration tool as described in this section and search for *VB*, and then install the templates you need. Website templates are installed in the root folder of your site in a folder named *Microsoft Templates*.

In the next section, you'll see how easy is it is to add code to the *default.cshtml* page in order to create a dynamic page.

Using ASP.NET Web Pages Code

In this procedure, you'll create a page that uses simple code to display the server date and time on the page. The example here will introduce you to the Razor syntax that lets you embed code into the HTML on ASP.NET Web Pages. (You can read more about this in the next chapter.) The code introduces one of the helpers that you read about earlier in the chapter.

> **Note** To get the complete sample code for this book, go to the Microsoft Download Center.

1. Open your *default.cshtml* file.
2. Add markup to the page so that it looks like the following example:

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8" />
        <title>Hello World Page</title>
    </head>
    <body>
    <h1>Hello World Page</h1>
    <p>Hello World!</p>
    <p>The time is @DateTime.Now</p>
    </body>
</html>
```

   The page contains ordinary HTML markup, with one addition: the `@` character marks ASP.NET program code.

3. Save the page and run it in the browser. You now see the current date and time on the page.

   The single line of code you've added does all the work of determining the current time on the server, formatting it for display, and sending it to the browser. (You can specify formatting options; this is just the default.)

Suppose you want to do something more complex, such as displaying a scrolling list of tweets from a Twitter user that you select. You can use a helper for that; as noted earlier, a helper is a component that

simplifies common tasks. In this case, all the work you'd otherwise have to do fetch and display a Twitter feed.

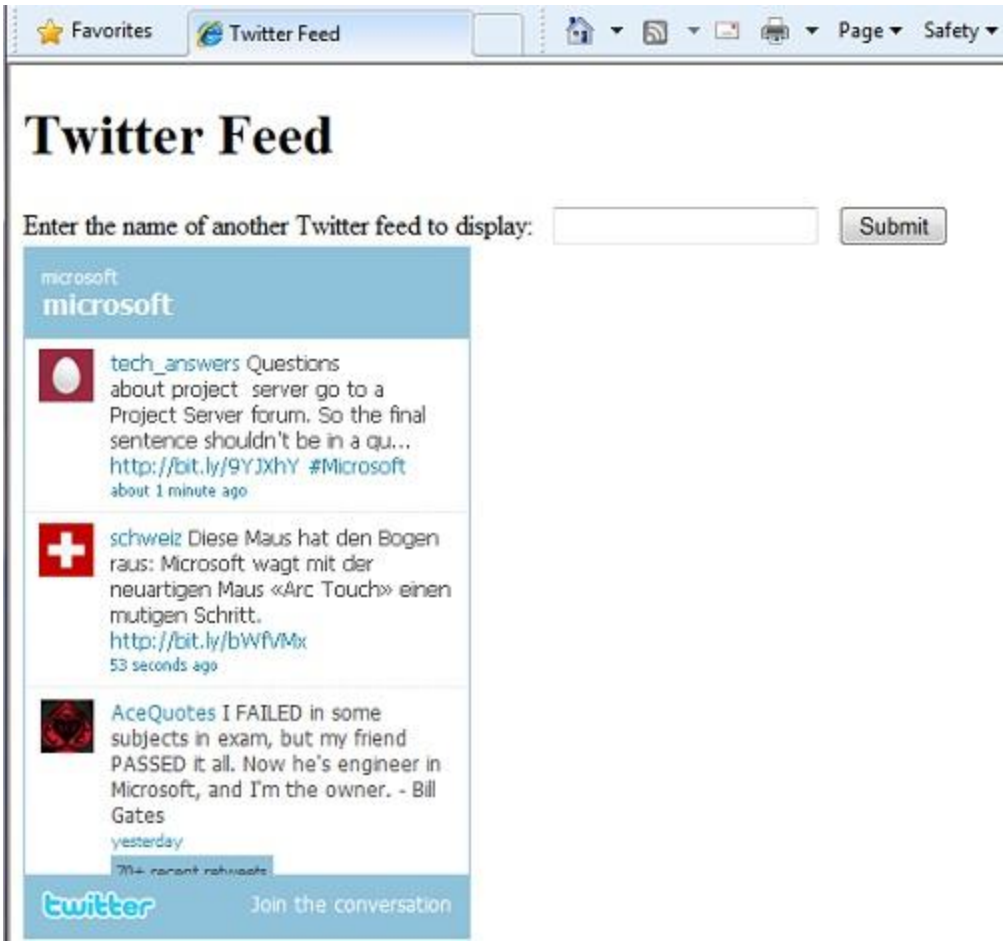
1. Create a new CSHTML file and name it *TwitterFeed.cshtml*.
2. In the page, replace the existing code with the following code:

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8" />
        <title>Twitter Feed</title>
    </head>
    <body>
        <h1>Twitter Feed</h1>
        <form action="" method="POST">
         <div>
            Enter the name of another Twitter feed to display:
             
            <input type="text" name="TwitterUser" value=""/>
             
            <input type="submit" value="Submit" />
         </div>
         <div>
            @if (Request["TwitterUser"].IsEmpty()) {
                @Twitter.Search("microsoft")
            }
            else {
                @Twitter.Profile(Request["TwitterUser"])
            }
         </div>
        </form>
    </body>
</html>
```

   This HTML creates a form that displays a text box for entering a user name, plus a **Submit** button. These are between the first set of `<div>` tags.

   Between the second set of `<div>` tags there's some code. (As you saw earlier, to mark code in ASP.NET Web pages, you use the `@` character.) The first time this page is displayed, or if the user clicks **Submit** but leaves the text box blank, the conditional expression `Request["TwitterUser"].IsEmpty` will be true. In that case, the page shows a Twitter feed that searches for the term "microsoft". Otherwise, the page shows a Twitter feed for whatever user name you entered in the text box.

3. Run the page in the browser. The Twitter feed displays tweets with "microsoft" in them.



4. Enter a Twitter user name and then click **Submit**. The new feed is displayed. (If you enter a nonexistent name, a Twitter feed is still displayed, it's just blank.)

   This example has shown you a little bit about how you can use WebMatrix and how you can program dynamic web pages using simple ASP.NET code using the Razor syntax. The next chapter examines code in more depth. The subsequent chapters then show you how to use code for many different types of website tasks.

Programming ASP.NET Razor Pages in Visual Studio

Besides using WebMatrix to program ASP.NET Razor pages, you can also use Visual Studio 2010, either one of the full editions or the free Visual Web Developer Express edition. If you use Visual Studio or Visual Web Developer to edit ASP.NET Razor pages, you get two programming tools that can enhance your productivity—IntelliSense and the debugger. IntelliSense works in the editor by displaying context-appropriate choices. For example, as you enter an HTML element, IntelliSense shows you a list of attributes that the element can have, and it even can show you what values you can set those attributes for. IntelliSense works for HTML, JavaScript, and C# and Visual Basic (the programming languages you use for ASP.NET Razor pages.)

The debugger lets you stop a program while it's running. You can then examine things like the values of variables, and you can step line by line through the program to see how it runs.

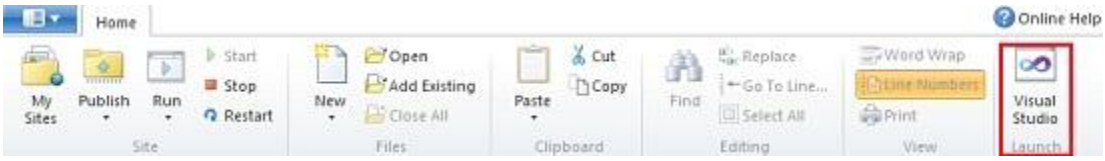
To work with ASP.NET Razor Pages in Visual Studio, you need the following software installed on your computer:

- Visual Studio 2010 or Visual Web Developer 2010 Express
- ASP.NET MVC 3 RTM.

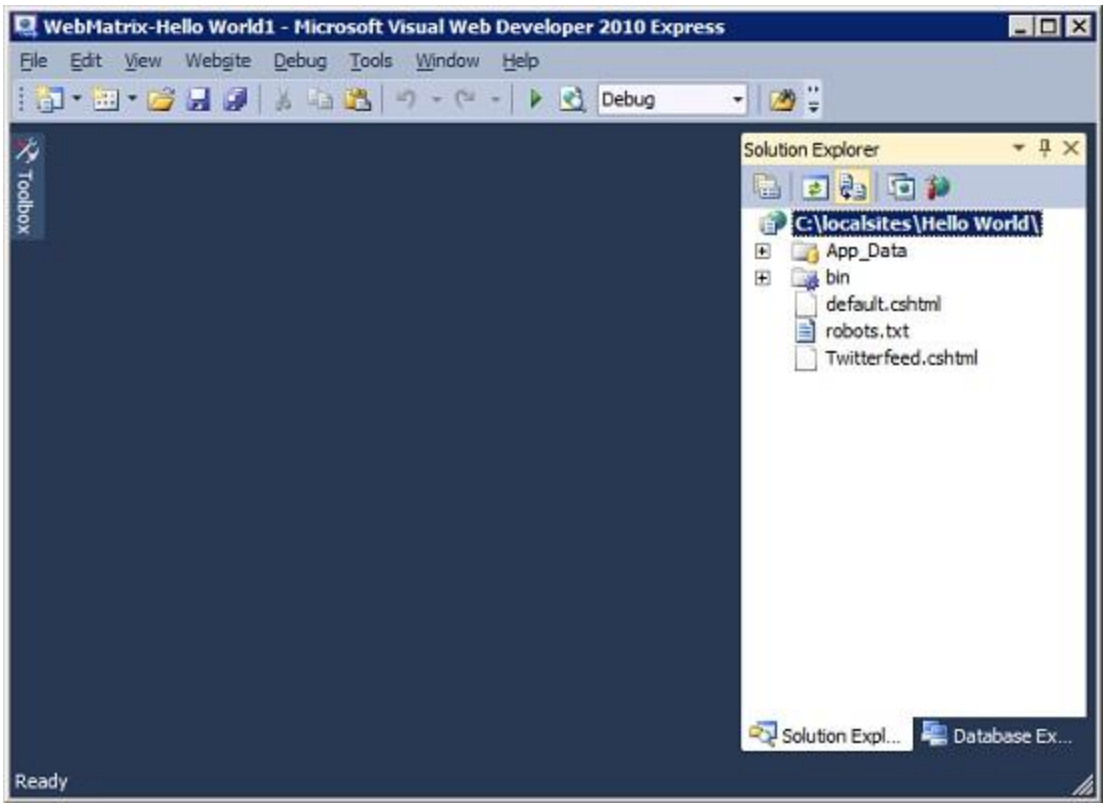
> **Note** You can install both Visual Web Developer 2010 Express and ASP.NET MVC 3 using the Web Platform Installer.

If you have Visual Studio installed, when you are editing a website in WebMatrix, you can launch the site in Visual Studio to take advantage of IntelliSense and the debugger.

1. Open the site that you created in this chapter and then click the **Files** workspace.
2. In the ribbon, click the **Visual Studio Launch** button.



After the site opens in Visual Studio, you can see the site structure in Visual Studio in the **Solution Explorer** pane. The following illustration shows the website opened in Visual Web Developer 2010 Express:



For an overview of how to use IntelliSense and the debugger with ASP.NET Razor pages in Visual Studio, see the appendix item Programming ASP.NET Web Pages in Visual Studio.

Creating and Testing ASP.NET Pages Using Your Own Text Editor

You don't have to use the WebMatrix editor to create and test an ASP.NET Web page. To create the page, you can use any text editor, including Notepad. Just be sure to save pages using the *.cshtml* filename extension. (Or *.vbhtml* if you want to use Visual Basic)

The easiest way to test *.cshtml* pages is to start the web server (IIS Express) using the WebMatrix **Run** button. If you don't want to use the WebMatrix tool, however, you can run the web server from the command line and associate it with a specific port number. You then specify that port when you request *.cshtml* files in your browser.

In Windows, open a command prompt with administrator privileges and change to the following folder:

C:\Program Files\IIS Express

For 64-bit systems, use this folder:

C:\Program Files (x86)\IIS Express

Enter the following command, using the actual path to your site:

```
iisexpress.exe /port:35896 /path:C:\BasicWebSite
```

It doesn't matter what port number you use, as long as the port isn't already reserved by some other process. (Port numbers above 1024 are typically free.)

For the path value, use the path of the website where the *.cshtml* files are that you want to test.

After this command runs, you can open a browser and browse to a *.cshtml* file, like this:

http://localhost:35896/default.cshtml

For help with IIS Express command line options, enter `iisexpress.exe /?` at the command line.

Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax

This chapter gives you an overview of programming with ASP.NET Web Pages using the Razor syntax. ASP.NET is Microsoft's technology for running dynamic web pages on web servers.

What you'll learn

- The top 8 programming tips for getting started with programming ASP.NET Web Pages using Razor syntax.
- Basic programming concepts you'll need for this book.
- What ASP.NET server code and the Razor syntax is all about.

The Top 8 Programming Tips

This section lists a few tips that you absolutely need to know as you start writing ASP.NET server code using the Razor syntax.

> **Note** The Razor syntax is based on the C# programming language, and that's the language used throughout this book. However, the Razor syntax also supports the Visual Basic language, and everything you see in this book you can also do in Visual Basic. For details, see the appendix Visual Basic Language and Syntax.

You can find more details about most of these programming techniques later in the chapter.

1. You add code to a page using the @ character

The @ character starts inline expressions, single statement blocks, and multi-statement blocks:

```
<!-- Single statement blocks  -->
@{ var total = 7; }
@{ var myMessage = "Hello World"; }

<!-- Inline expressions -->
<p>The value of your account is: @total </p>
<p>The value of myMessage is: @myMessage</p>

<!-- Multi-statement block -->
@{
    var greeting = "Welcome to our site!";
    var weekDay = DateTime.Now.DayOfWeek;
    var greetingMessage = greeting + " Today is: " + weekDay;
}
```

```
<p>The greeting is: @greetingMessage</p>
```

This is what these statements look like when the page runs in a browser:

HTML Encoding

When you display content in a page using the `@` character, as in the preceding examples, ASP.NET HTML-encodes the output. This replaces reserved HTML characters (such as `<` and `>` and `&`) with codes that enable the characters to be displayed as characters in a web page instead of being interpreted as HTML tags or entities. Without HTML encoding, the output from your server code might not display correctly, and could expose a page to security risks.

If your goal is to output HTML markup that renders tags as markup (for example `<p></p>` for a paragraph or `<em></em>` to emphasize text), see the section Combining Text, Markup, and Code in Code Blocks later in this chapter.

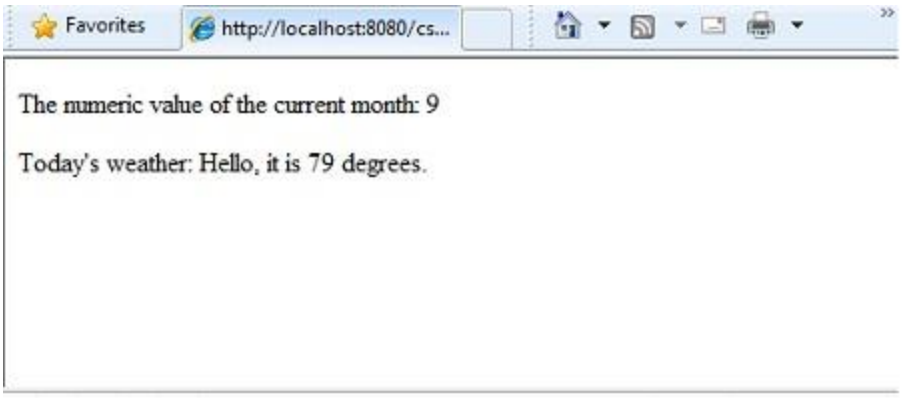
You can read more about HTML encoding in Chapter 4 - Working with Forms.

2. You enclose code blocks in braces

A *code block* includes one or more code statements and is enclosed in braces.

```
<!-- Single statement block.  -->
@{ var theMonth = DateTime.Now.Month; }
<p>The numeric value of the current month: @theMonth</p>

<!-- Multi-statement block. -->
@{
    var outsideTemp = 79;
    var weatherMessage = "Hello, it is " + outsideTemp + " degrees.";
}
<p>Today's weather: @weatherMessage</p>
```

The result displayed in a browser:



3. Inside a block, you end each code statement with a semicolon

Inside a code block, each complete code statement must end with a semicolon. Inline expressions don't end with a semicolon.

```
<!-- Single-statement block -->
@{ var theMonth = DateTime.Now.Month; }

<!-- Multi-statement block -->
@{
    var outsideTemp = 79;
    var weatherMessage = "Hello, it is " + outsideTemp + " degrees.";
}

<!-- Inline expression, so no semicolon -->
<p>Today's weather: @weatherMessage</p>
```

4. You use variables to store values

You can store values in a *variable*, including strings, numbers, and dates, etc. You create a new variable using the `var` keyword. You can insert variable values directly in a page using `@`.

```
<!-- Storing a string -->
@{ var welcomeMessage = "Welcome, new members!"; }
<p>@welcomeMessage</p>

<!-- Storing a date -->
@{ var year = DateTime.Now.Year; }

<!-- Displaying a variable -->
<p>Welcome to our new members who joined in @year!</p>
```

The result displayed in a browser:

5. You enclose literal string values in double quotation marks

A *string* is a sequence of characters that are treated as text. To specify a string, you enclose it in double quotation marks:

```
@{ var myString = "This is a string literal"; }
```

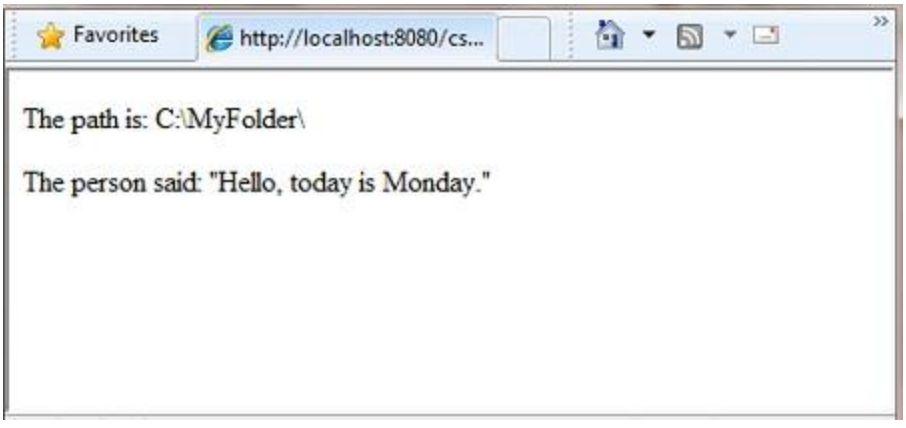
If the string that you want to display contains a backslash character (\) or double quotation marks, use a *verbatim string literal* that's prefixed with the @ operator. (In C#, the \ character has special meaning unless you use a verbatim string literal.)

```
<!-- Embedding a backslash in a string -->
@{ var myFilePath = @"C:\MyFolder\"; }
<p>The path is: @myFilePath</p>
```

To embed double quotation marks, use a verbatim string literal and repeat the quotation marks:

```
<!-- Embedding double quotation marks in a string -->
@{ var myQuote = @"The person said: ""Hello, today is Monday."""; }
<p>@myQuote</p>
```

The result displayed in a browser:



> **Note** The `@` character is used both to mark verbatim string literals in C# and to mark code in ASP.NET pages.

6. Code is case sensitive

In C#, keywords (like `var`, `true`, and `if`) and variable names are case sensitive. The following lines of code create two different variables, `lastName` and `LastName`.

```
@{
    var lastName = "Smith";
    var LastName = "Jones";
}
```

If you declare a variable as `var lastName = "Smith";` and if you try to reference that variable in your page as `@LastName`, an error results because `LastName` won't be recognized.

> **Note** In Visual Basic, keywords and variables are *not* case sensitive.

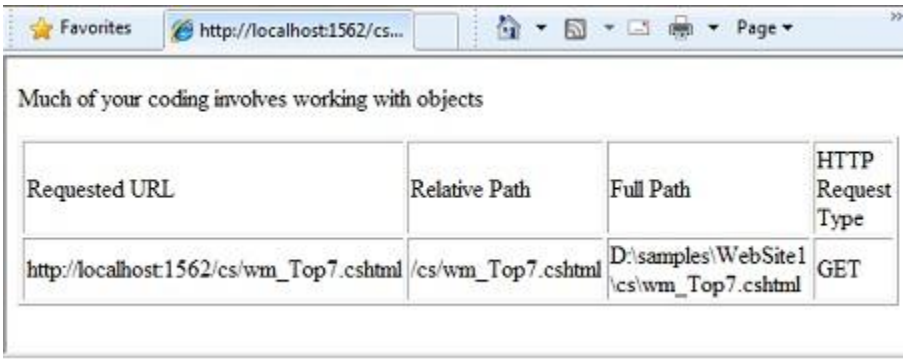
7. Much of your coding involves objects

An *object* represents a thing that you can program with — a page, a text box, a file, an image, a web request, an email message, a customer record (database row), etc. Objects have properties that describe their characteristics — a text box object has a `Text` property (among others), a request object has a `Url` property, an email message has a `From` property, and a customer object has a `FirstName` property. Objects also have methods that are the "verbs" they can perform. Examples include a file object's `Save` method, an image object's `Rotate` method, and an email object's `Send` method.

You'll often work with the `Request` object, which gives you information like the values of form fields on the page (text boxes, etc.), what type of browser made the request, the URL of the page, the user identity, etc. This example shows how to access properties of the `Request` object and how to call the `MapPath` method of the `Request` object, which gives you the absolute path of the page on the server:

```
<table border="1">
<tr>
    <td>Requested URL</td>
    <td>Relative Path</td>
    <td>Full Path</td>
    <td>HTTP Request Type</td>
</tr>
<tr>
    <td>@Request.Url</td>
    <td>@Request.FilePath</td>
    <td>@Request.MapPath(Request.FilePath)</td>
    <td>@Request.RequestType</td>
</tr>
</table>
```

The result displayed in a browser:



8. You can write code that makes decisions

A key feature of dynamic web pages is that you can determine what to do based on conditions. The most common way to do this is with the `if` statement (and optional `else` statement).

```
@{
   var result = "";
   if(IsPost)
   {
      result = "This page was posted using the Submit button.";
   }
   else
   {
      result = "This was the first request for this page.";
   }
}

<!DOCTYPE html>
<html>
    <head>
        <title></title>
    </head>
<body>
<form method="POST" action="" >
  <input type="Submit" name="Submit" value="Submit"/>
  <p>@result</p>
</form>
</body>
</html>
    </body>
</html>
```

The statement `if(IsPost)` is a shorthand way of writing `if(IsPost == true)`. Along with `if` statements, there are a variety of ways to test conditions, repeat blocks of code, and so on, which are described later in this chapter.

The result displayed in a browser (after clicking **Submit**):

HTTP GET and POST Methods and the IsPost Property

The protocol used for web pages (HTTP) supports a very limited number of methods (verbs) that are used to make requests to the server. The two most common ones are GET, which is used to read a page, and POST, which is used to submit a page. In general, the first time a user requests a page, the page is requested using GET. If the user fills in a form and then clicks **Submit**, the browser makes a POST request to the server.

In web programming, it's often useful to know whether a page is being requested as a GET or as a POST so that you know how to process the page. In ASP.NET Web Pages, you can use the `IsPost` property to see whether a request is a GET or a POST. If the request is a POST, the `IsPost` property will return true, and you can do things like read the values of text boxes on a form. Many examples in this book show you how to process the page differently depending on the value of `IsPost`.

A Simple Code Example

This procedure shows you how to create a page that illustrates basic programming techniques. In the example, you create a page that lets users enter two numbers, then it adds them and displays the result.

1. In your editor, create a new file and name it *AddNumbers.cshtml*.
2. Copy the following code and markup into the page, replacing anything already in the page.

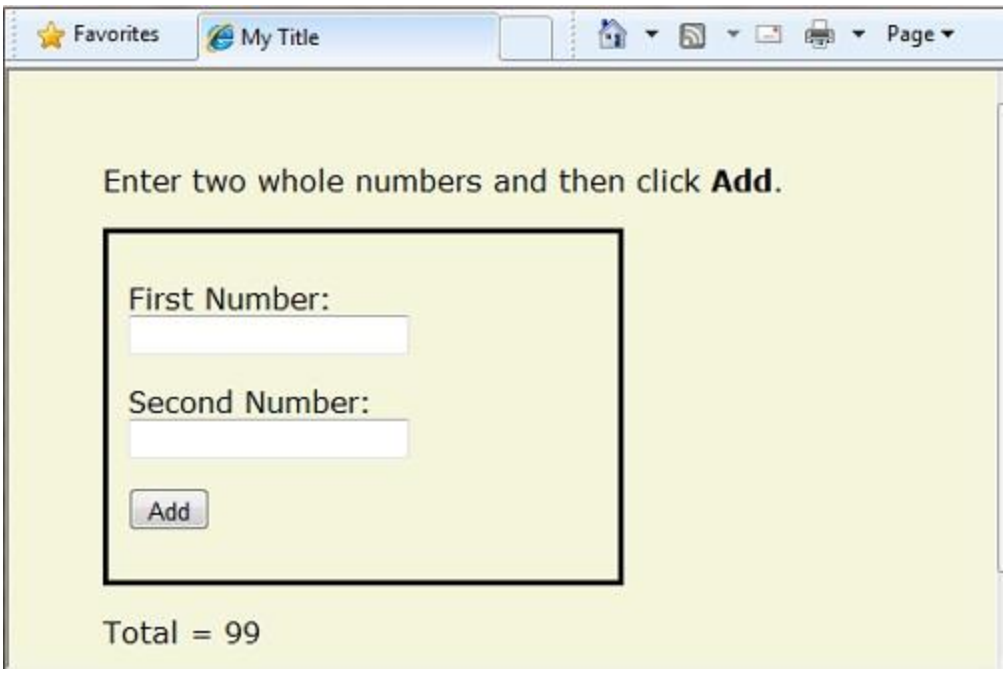
```
@{
    var total = 0;
    var totalMessage = "";
    if(IsPost) {

        // Retrieve the numbers that the user entered.
        var num1 = Request["text1"];
        var num2 = Request["text2"];

        // Convert the entered strings into integers numbers and add.
        total = num1.AsInt() + num2.AsInt();
        totalMessage = "Total = " + total;
    }
```

```
}

<!DOCTYPE html>
<html lang="en">
  <head>
    <title>Add Numbers</title>
    <meta charset="utf-8" />
    <style type="text/css">
      body {background-color: beige; font-family: Verdana, Arial;
            margin: 50px; }
      form {padding: 10px; border-style: solid; width: 250px;}
    </style>
  </head>
<body>
  <p>Enter two whole numbers and then click <strong>Add</strong>.</p>
  <form action="" method="post">
    <p><label for="text1">First Number:</label>
      <input type="text" name="text1" />
    </p>
    <p><label for="text2">Second Number:</label>
      <input type="text" name="text2" />
    </p>
    <p><input type="submit" value="Add" /></p>
  </form>

  <p>@totalMessage</p>

</body>
</html>
```

Here are some things for you to note:

- The `@` character starts the first block of code in the page, and it precedes the `totalMessage` variable that's embedded near the bottom of the page.
- The block at the top of the page is enclosed in braces.
- In the block at the top, all lines end with a semicolon.
- The variables `total`, `num1`, `num2`, and `totalMessage` store several numbers and a string.
- The literal string value assigned to the `totalMessage` variable is in double quotation marks.
- Because the code is case-sensitive, when the `totalMessage` variable is used near the bottom of the page, its name must match the variable at the top exactly.
- The expression `num1.AsInt() + num2.AsInt()` shows how to work with objects and methods. The `AsInt` method on each variable converts the string entered by a user to a number (an integer) so that you can perform arithmetic on it.
- The `<form>` tag includes a `method="post"` attribute. This specifies that when the user clicks **Add**, the page will be sent to the server using the HTTP POST method. When the page is submitted, the `if(IsPost)` test evaluates to true and the conditional code runs, displaying the result of adding the numbers.

3. Save the page and run it in a browser. (Make sure the page is selected in the **Files** workspace before you run it.) Enter two whole numbers and then click the **Add** button.



Basic Programming Concepts

As you saw in Chapter 1 - Getting Started with ASP.NET Web Pages and in the previous example, even if you've never programmed before, with WebMatrix, ASP.NET web pages, and the Razor syntax, you can quickly create dynamic web pages with sophisticated features, and it won't take much code to get things done.

This chapter provides you with an overview of ASP.NET web programming. It isn't an exhaustive examination, just a quick tour through the programming concepts you'll use most often. Even so, it covers almost everything you'll need for the rest of the book.

But first, a little technical background.

The Razor Syntax, Server Code, and ASP.NET

Razor syntax is a simple programming syntax for embedding server-based code in a web page. In a web page that uses the Razor syntax, there are two kinds of content: client content and server code. Client content is the stuff you're used to in web pages: HTML markup (elements), style information such as CSS, client script such as JavaScript, and plain text.

Razor syntax lets you add server code to this client content. If there's server code in the page, the server runs that code first, before it sends the page to the browser. By running on the server, the code can perform tasks that can be a lot more complex to do using client content alone, like accessing server-based databases. Most importantly, server code can dynamically create client content — it can generate HTML markup or other content on the fly and then send it to the browser along with any static HTML that the page might contain. From the browser's perspective, client content that's generated by your

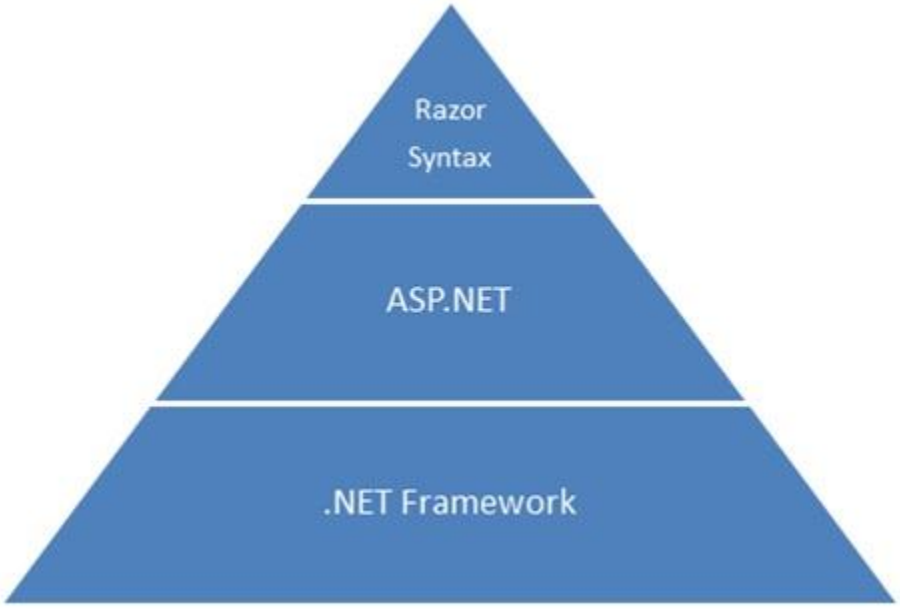
server code is no different than any other client content. As you've already seen, the server code that's required is quite simple.

ASP.NET web pages that include the Razor syntax have a special file extension (*.cshtml* or *.vbhtml*). The server recognizes these extensions, runs the code that's marked with Razor syntax, and then sends the page to the browser.

Where does ASP.NET fit in?

Razor syntax is based on a technology from Microsoft called ASP.NET, which in turn is based on the Microsoft .NET Framework. The.NET Framework is a big, comprehensive programming framework from Microsoft for developing virtually any type of computer application. ASP.NET is the part of the .NET Framework that's specifically designed for creating web applications. Developers have used ASP.NET to create many of the largest and highest-traffic websites in the world. (Any time you see the file-name extension *.aspx* as part of the URL in a site, you'll know that the site was written using ASP.NET.)

The Razor syntax gives you all the power of ASP.NET, but using a simplified syntax that's easier to learn if you're a beginner and that makes you more productive if you're an expert. Even though this syntax is simple to use, its family relationship to ASP.NET and the .NET Framework means that as your websites become more sophisticated, you have the power of the larger frameworks available to you.



Classes and Instances

ASP.NET server code uses objects, which are in turn built on the idea of classes. The class is the definition or template for an object. For example, an application might contain a `Customer` class that defines the properties and methods that any customer object needs.

When the application needs to work with actual customer information, it creates an instance of (or *instantiates*) a customer object. Each individual customer is a separate instance of the `Customer` class. Every instance supports the same properties and methods, but the property values for each instance are typically different, because each customer object is unique. In one customer object, the `LastName` property might be "Smith"; in another customer object, the `LastName` property might be "Jones."

Similarly, any individual web page in your site is a `Page` object that's an instance of the `Page` class. A button on the page is a `Button` object that is an instance of the `Button` class, and so on. Each instance has its own characteristics, but they all are based on what's specified in the object's class definition.

Language and Syntax

Earlier you saw a basic example of how to create an ASP.NET Web Pages page, and how you can add server code to HTML markup. Here you'll learn the basics of writing ASP.NET server code using the Razor syntax — that is, the programming language rules.

If you're experienced with programming (especially if you've used C, C++, C#, Visual Basic, or JavaScript), much of what you read here will be familiar. You'll probably need to familiarize yourself only with how server code is added to markup in *.cshtml* files.

Basic Syntax

Combining Text, Markup, and Code in Code Blocks

In server code blocks, you'll often want to output text or markup (or both) to the page. If a server code block contains text that's not code and that instead should be rendered as is, ASP.NET needs to be able to distinguish that text from code. There are several ways to do this.

- Enclose the text in an HTML element like `<p></p>` or `<em></em>`:

```
@if(IsPost) {
    // This line has all content between matched <p> tags.
    <p>Hello, the time is @DateTime.Now and this page is a postback!</p>
} else {
    // All content between matched tags, followed by server code.
    <p>Hello <em>stranger</em>, today is: <br /> </p>  @DateTime.Now
}
```

  The HTML element can include text, additional HTML elements, and server-code expressions. When ASP.NET sees the opening HTML tag, it renders everything including the element and its content as is to the browser (and resolves the server-code expressions).

- Use the `@:` operator or the `<text>` element. The `@:` outputs a single line of content containing plain text or unmatched HTML tags; the `<text>` element encloses multiple lines to output. These options are useful when you don't want to render an HTML element as part of the output.

```
@if(IsPost) {
    // Plain text followed by an unmatched HTML tag and server code.
    @: The time is: <br /> @DateTime.Now
    // Server code and then plain text, matched tags, and more text.
    @DateTime.Now @:is the <em>current</em> time.
}
```

If you want to output multiple lines of text or unmatched HTML tags, you can precede each line with `@:`, or you can enclose the line in a `<text>` element. Like the `@:` operator, `<text>` tags are used by ASP.NET to identify text content and are never rendered in the page output.

```
@if(IsPost) {
    // Repeat the previous example, but use <text> tags.
    <text>
    The time is: <br /> @DateTime.Now
    @DateTime.Now is the <em>current</em> time.
    </text>
}

@{
    var minTemp = 75;
    <text>It is the month of @DateTime.Now.ToString("MMMM"), and
    it's a <em>great</em> day! <br /><p>You can go swimming if it's at
    least @minTemp degrees. </p></text>
}
```

The first example repeats the previous example but uses a single pair of `<text>` tags to enclose the text to render. In the second example, the `<text>` and `</text>` tags enclose three lines, all of which have some uncontained text and unmatched HTML tags (`<br />`), along with server code and matched HTML tags. Again, you could also precede each line individually with the `@:` operator; either way works.

> **Note** When you output text as shown in this section — using an HTML element, the `@:` operator, or the `<text>` element — ASP.NET doesn't HTML-encode the output. (As noted earlier, ASP.NET does encode the output of server code expressions and server code blocks that are preceded by `@`, except in the special cases noted in this section.)

Whitespace

Extra spaces in a statement (and outside of a string literal) don't affect the statement:

```
@{ var lastName =    "Smith"; }
```

A line break in a statement has no effect on the statement, and you can wrap statements for readability. The following statements are the same:

```
@{ var theName =
"Smith"; }

@{
```

```
    var
    personName
    =
    "Smith"
    ;
}
```

However, you can't wrap a line in the middle of a string literal. The following example doesn't work:

```
@{ var test = "This is a long
    string"; }  // Does not work!
```

To combine a long string that wraps to multiple lines like the above code, there are two options. You can use the concatenation operator (+), which you'll see later in this chapter. You can also use the @ character to create a verbatim string literal, as you saw earlier in this chapter. You can break verbatim string literals across lines:

```
@{ var longString = @"This is a
    long
    string";
}
```

Code (and Markup) Comments

Comments let you leave notes for yourself or others. They also allow you to disable ("comment out") a section of code or markup that you don't want to run but want to keep in your page for the time being.

There's different commenting syntax for Razor code and for HTML markup. As with all Razor code, Razor comments are processed (and then removed) on the server before the page is sent to the browser. Therefore, the Razor commenting syntax lets you put comments into the code (or even into the markup) that you can see when you edit the file, but that users don't see, even in the page source.

For ASP.NET Razor comments, you start the comment with @* and end it with *@. The comment can be on one line or multiple lines:

```
@*  A one-line code comment. *@

@*
    This is a multiline code comment.
    It can continue for any number of lines.
*@
```

Here is a comment within a code block:

```
@{
    @* This is a comment. *@
    var theVar = 17;
}
```

Here is the same block of code, with the line of code commented out so that it won't run:

```
@{
    @* This is a comment. *@
    @* var theVar = 17;  *@
}
```

Inside a code block, as an alternative to using Razor comment syntax, you can use the commenting syntax of the programming language you're using, such as C#:

```
@{
    // This is a comment.
    var myVar = 17;
    /* This is a multi-line comment
    that uses C# commenting syntax. */
}
```

In C#, single-line comments are preceded by the `//` characters, and multi-line comments begin with `/*` and end with `*/`. (As with Razor comments, C# comments are not rendered to the browser.)

For markup, as you probably know, you can create an HTML comment:

```
<!-- This is a comment.  -->
```

HTML comments start with `<!--` characters and end with `-->`. You can use HTML comments to surround not only text, but also any HTML markup that you may want to keep in the page but don't want to render. This HTML comment will hide the entire content of the tags and the text they contain:

```
<!-- <p>This is my paragraph.</p>  -->
```

Unlike Razor comments, HTML comments *are* rendered to the page and the user can see them by viewing the page source.

Variables

A variable is a named object that you use to store data. You can name variables anything, but the name must begin with an alphabetic character and it cannot contain whitespace or reserved characters.

Variables and Data Types

A variable can have a specific data type, which indicates what kind of data is stored in the variable. You can have string variables that store string values (like "Hello world"), integer variables that store whole-number values (like 3 or 79), and date variables that store date values in a variety of formats (like 4/12/2010 or March 2009). And there are many other data types you can use.

However, you generally don't have to specify a type for a variable. Most of the time, ASP.NET can figure out the type based on how the data in the variable is being used. (Occasionally you must specify a type; you'll see examples in this book where this is true.)

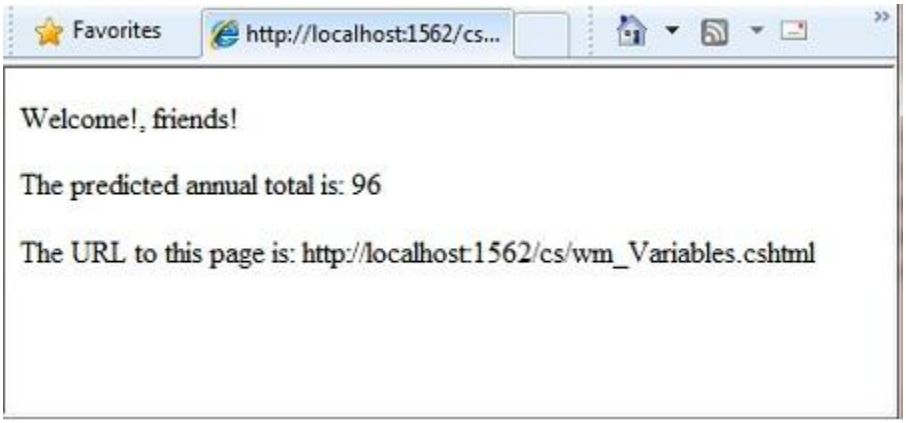
You declare a variable using the `var` keyword (if you don't want to specify a type) or by using the name of the type:

```
@{
    // Assigning a string to a variable.
    var greeting = "Welcome!";

    // Assigning a number to a variable.
    var theCount = 3;

    // Assigning an expression to a variable.
    var monthlyTotal = theCount + 5;

    // Assigning a date value to a variable.
    var today = DateTime.Today;

    // Assigning the current page's URL to a variable.
    var myPath = this.Request.Url;

    // Declaring variables using explicit data types.
    string name = "Joe";
    int count = 5;
    DateTime tomorrow = DateTime.Now.AddDays(1);
}
```

The following example shows some typical uses of variables in a web page:

```
@{
    // Embedding the value of a variable into HTML markup.
    <p>@greeting, friends!</p>

    // Using variables as part of an inline expression.
    <p>The predicted annual total is: @( monthlyTotal * 12)</p>

    // Displaying the page URL with a variable.
    <p>The URL to this page is: @myPath</p>
}
```

The result displayed in a browser:



Converting and Testing Data Types

Although ASP.NET can usually determine a data type automatically, sometimes it can't. Therefore, you might need to help ASP.NET out by performing an explicit conversion. Even if you don't have to convert types, sometimes it's helpful to test to see what type of data you might be working with.

The most common case is that you have to convert a string to another type, such as to an integer or date. The following example shows a typical case where you must convert a string to a number.

```
@{
    var total = 0;

    if(IsPost) {
        // Retrieve the numbers that the user entered.
        var num1 = Request["text1"];
        var num2 = Request["text2"];
        // Convert the entered strings into integers numbers and add.
        total = num1.AsInt() + num2.AsInt();
    }
}
```

As a rule, user input comes to you as strings. Even if you've prompted users to enter a number, and even if they've entered a digit, when user input is submitted and you read it in code, the data is in string format. Therefore, you must convert the string to a number. In the example, if you try to perform arithmetic on the values without converting them, the following error results, because ASP.NET cannot add two strings:

Cannot implicitly convert type 'string' to 'int'.

To convert the values to integers, you call the `AsInt` method. If the conversion is successful, you can then add the numbers.

The following table lists some common conversion and test methods for variables.

Method	Description	Example

`AsInt()`, `IsInt()`	Converts a string that represents a whole number (like "593") to an integer.	`var myIntNumber = 0;`
		`var myStringNum = "539";`
		`if(myStringNum.IsInt()==true){`
		`  myIntNumber = myStringNum.AsInt();`
		`}`

`AsBool()`, `IsBool()`	Converts a string like "true" or "false" to a Boolean type.	`var myStringBool = "True";` `var myVar = myStringBool.AsBool();`
`AsFloat()`, `IsFloat()`	Converts a string that has a decimal value like "1.3" or "7.439" to a floating-point number.	`var myStringFloat = "41.432895";` `var myFloatNum = myStringFloat.AsFloat();`

`AsDecimal()`, `IsDecimal()`	Converts a string that has a decimal value like "1.3" or "7.439" to a decimal number. (In ASP.NET, a decimal number is more precise than a floating-point number.)	`var myStringDec = "10317.425";` `var myDecNum = myStringDec.AsDecimal();`
`AsDateTime()`, `IsDateTime()`	Converts a string that represents a date and time value to the ASP.NET `DateTime` type.	`var myDateString = "12/27/2010";` `var newDate = myDateString.AsDateTime();`

`ToString()`	Converts any other data type to a string.	`int num1 = 17;`
		`int num2 = 76;`
		`// myString is set to 1776`
		`string myString = num1.ToString() +`
		`  num2.ToString();`

Operators

An operator is a keyword or character that tells ASP.NET what kind of command to perform in an expression. The C# language (and the Razor syntax that's based on it) supports many operators, but you only need to recognize a few to get started. The following table summarizes the most common operators.

Operator	Description	Examples

`+`
`-`
`*`
`/`
	Math operators used in numerical expressions.	`@(5 + 13)`
		`@{ var netWorth = 150000; }`
		`@{ var newTotal = netWorth * 2; }`
		`@(newTotal / 2)`

`=`	Assignment. Assigns the value on the right side of a statement to the object on the left side.	`var age = 17;`

`==`	Equality. Returns `true` if the values are equal. (Notice the distinction between the `=` operator and the `==` operator.)	`var myNum = 15;`
		`if (myNum == 15) {`
		`  // Do something.`
		`}`

`!=`	Inequality. Returns `true` if the values are not equal.	`var theNum = 13;`
		`if (theNum != 15) {`
		`  // Do something.`
		`}`

`<`
`>`
`<=`
`>=`
	Less-than,
	greater-than,
	less-than-or-equal, and
	greater-than-or-equal.
		`if (2 < 3) {`
		`  // Do something.`
		`}`
		`var currentCount = 12;`
		`if(currentCount >= 12) {`
		`  // Do something.`
		`}`

+	Concatenation, which is used to join strings. ASP.NET knows the difference between this operator and the addition operator based on the data type of the expression.	`// The displayed result is "abcdef".` `@("abc" + "def")`
+= -=	The increment and decrement operators, which add and subtract 1 (respectively) from a variable.	`int theCount = 0;` `theCount += 1; // Adds 1 to count`

.	Dot. Used to distinguish objects and their properties and methods.	`var myUrl = Request.Url;`
		`var count =`
		`Request["Count"].AsInt();`

()	Parentheses. Used to group expressions and to pass parameters to methods.	`@(3 + 7)` `@Request.MapPath(Request.FilePath);`
[]	Brackets. Used for accessing values in arrays or collections.	`var income =` `Request["AnnualIncome"];`

!	Not. Reverses a `true` value to `false` and vice versa. Typically used as a shorthand way to test for `false` (that is, for not `true`).	`bool taskCompleted = false;`
		`// Processing.`
		`if(!taskCompleted) {`
		`    // Continue processing`
		`}`

&&
 	
||
	Logical AND and OR, which are used to link conditions together.	`bool myTaskCompleted = false;`
		`int totalCount = 0;`
		`// Processing.`
		`if(!myTaskCompleted && totalCount <`
		`12) {`
		`    // Continue processing.`
		`}`

Working with File and Folder Paths in Code

You'll often work with file and folder paths in your code. Here is an example of physical folder structure for a website as it might appear on your development computer:

```
C:\WebSites\MyWebSite
    default.cshtml
    datafile.txt
    \images
        Logo.jpg
    \styles
        Styles.css
```

Here are some essential details about URLs and paths:

- A URL begins with either a domain name (*http://www.example.com*) or a server name (*http://localhost*, *http://mycomputer*).
- A URL corresponds to a physical path on a host computer. For example, *http://myserver* might correspond to the folder *C:\websites\mywebsite* on the server.
- A virtual path is shorthand to represent paths in code without having to specify the full path. It includes the portion of a URL that follows the domain or server name. When you use virtual paths, you can move your code to a different domain or server without having to update the paths.

Here's an example to help you understand the differences:

Complete URL	*http://mycompanyserver/humanresources/CompanyPolicy.htm*
Server name	mycompanyserver
Virtual path	*/humanresources/CompanyPolicy.htm*
Physical path	*C:\mywebsites\humanresources\CompanyPolicy.htm*

The virtual root is /, just like the root of your C: drive is \. (Virtual folder paths always use forward slashes.) The virtual path of a folder doesn't have to have the same name as the physical folder; it can be an alias. (On production servers, the virtual path rarely matches an exact physical path.)

When you work with files and folders in code, sometimes you need to reference the physical path and sometimes a virtual path, depending on what objects you're working with. ASP.NET gives you these tools for working with file and folder paths in code: the ~ operator, the `Server.MapPath` method, and the `Href` method.

The ~ operator: Getting the virtual root

In server code, to specify the virtual root path to folders or files, use the ~ operator. This is useful because you can move your website to a different folder or location without breaking the paths in your code.

```
@{
    var myImagesFolder = "~/images";
    var myStyleSheet = "~/styles/StyleSheet.css";
}
```

The Server.MapPath method: Converting virtual to physical paths

The `Server.MapPath` method converts a virtual path (like */default.cshtml*) to an absolute physical path (like *C:\WebSites\MyWebSiteFolder\default.cshtml*). You use this method for tasks that require a complete physical path, like reading or writing a text file on the web server. (You typically don't know the absolute physical path of your site on a hosting site's server.) You pass the virtual path to a file or folder to the method, and it returns the physical path:

```
@{
    var dataFilePath = "~/dataFile.txt";
}
<!-- Displays a physical path C:\Websites\MyWebSite\datafile.txt  -->
<p>@Server.MapPath(dataFilePath)</p>
```

The Href method: Creating paths to site resources

The `Href` method of the `WebPage` object converts paths that you create in server code (which can include the ~ operator) to paths that the browser understands. (The browser can't understand the ~ operator, because that's strictly an ASP.NET operator.) You use the `Href` method to create paths to resources like image files, other web pages, and CSS files. For example, you can use this method in HTML markup for attributes of `<img>` elements, `<link>` elements, and `<a>` elements.

```
@{
    var myImagesFolder = "~/images";
    var myStyleSheet = "~/styles/StyleSheet.css";
}

<!-- This code creates the path "../images/Logo.jpg" in the src attribute. -->
<img src="@Href(myImagesFolder)/Logo.jpg" />

<!-- This produces the same result, using a path with ~  -->
<img src="@Href("~/images")/Logo.jpg" />

<!-- This creates a link to the CSS file. -->
<link rel="stylesheet" type="text/css" href="@Href(myStyleSheet)" />
```

Conditional Logic and Loops

ASP.NET server code lets you perform tasks based on conditions and write code that repeats statements a specific number of times (that is, code that runs a loop).

Testing Conditions

To test a simple condition you use the `if` statement, which returns true or false based on a test you specify:

```
@{
  var showToday = true;
  if(showToday)
  {
    @DateTime.Today;
  }
}
```

The `if` keyword starts a block. The actual test (condition) is in parentheses and returns true or false. The statements that run if the test is true are enclosed in braces. An `if` statement can include an `else` block that specifies statements to run if the condition is false:

```
@{
```

```
  var showToday = false;
  if(showToday)
  {
    @DateTime.Today;
  }
  else
  {
    <text>Sorry!</text>
  }
}
```

You can add multiple conditions using an `else if` block:

```
@{
    var theBalance = 4.99;
    if(theBalance == 0)
    {
        <p>You have a zero balance.</p>
    }
    else if (theBalance  > 0 && theBalance <= 5)
    {
        <p>Your balance of $@theBalance is very low.</p>
    }
    else
    {
        <p>Your balance is: $@theBalance</p>
    }
}
```

In this example, if the first condition in the if block is not true, the `else if` condition is checked. If that condition is met, the statements in the `else if` block are executed. If none of the conditions are met, the statements in the `else` block are executed. You can add any number of else if blocks, and then close with an `else` block as the "everything else" condition.

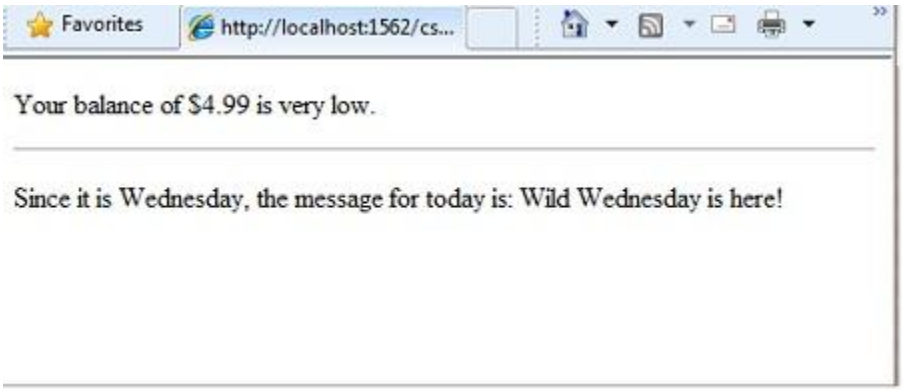
To test a large number of conditions, use a `switch` block:

```
@{
    var weekday = "Wednesday";
    var greeting = "";

    switch(weekday)
    {
        case "Monday":
            greeting = "Ok, it's a marvelous Monday";
            break;
        case "Tuesday":
            greeting = "It's a tremendous Tuesday";
            break;
        case "Wednesday":
            greeting = "Wild Wednesday is here!";
            break;
        default:
            greeting = "It's some other day, oh well.";
            break;
    }
```

```
    <p>Since it is @weekday, the message for today is: @greeting</p>
}
```

The value to test is in parentheses (in the example, the weekday variable). Each individual test uses a `case` statement that ends with a colon (:). If the value of a `case` statement matches the test value, the code in that case block is executed. You close each case statement with a `break` statement. (If you forget to include break in each `case` block, the code from the next `case` statement will run also.) A `switch` block often has a `default` statement as the last case for an "everything else" option that runs if none of the other cases are true.

The result of the last two conditional blocks displayed in a browser:



Looping Code

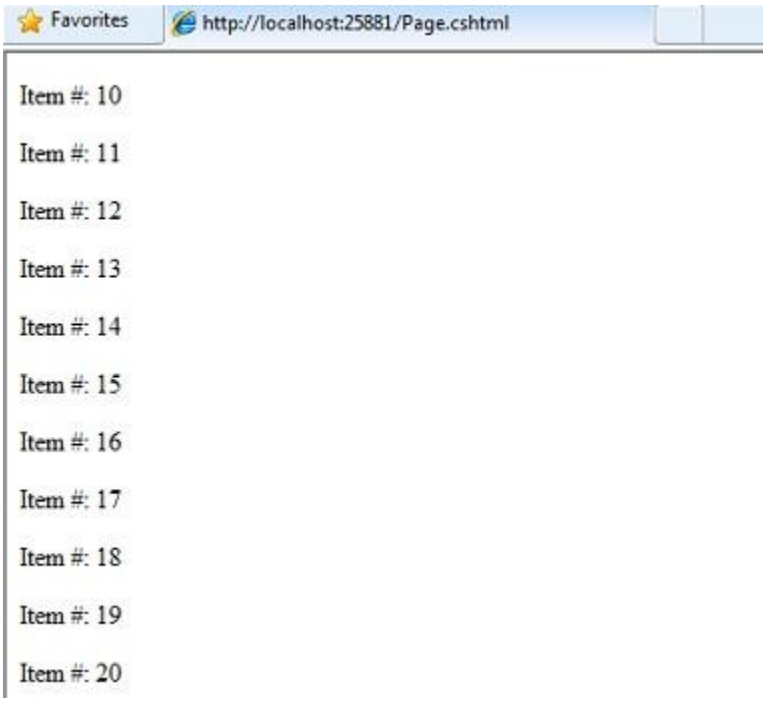
You often need to run the same statements repeatedly. You do this by looping. For example, you often run the same statements for each item in a collection of data. If you know exactly how many times you want to loop, you can use a `for` loop. This kind of loop is especially useful for counting up or counting down:

```
@for(var i = 10; i < 21; i++)
{
    <p>Line #: @i</p>
}
```

The loop begins with the `for` keyword, followed by three statements in parentheses, each terminated with a semicolon.

- Inside the parentheses, the first statement (`var i=10;`) creates a counter and initializes it to 10. You don't have to name the counter `i` — you can use any legal variable name. When the `for` loop runs, the counter is automatically incremented.
- The second statement (`i < 21;`) sets the condition for how far you want to count. In this case, you want it to go to a maximum of 20 (that is, keep going while the counter is less than 21).
- The third statement (`i++`) uses an increment operator, which simply specifies that the counter should have 1 added to it each time the loop runs.

Inside the braces is the code that will run for each iteration of the loop. The markup creates a new paragraph (`<p>` element) each time and adds a line to the output, displaying the value of i (the counter). When you run this page, the example creates 11 lines displaying the output, with the text in each line indicating the item number.

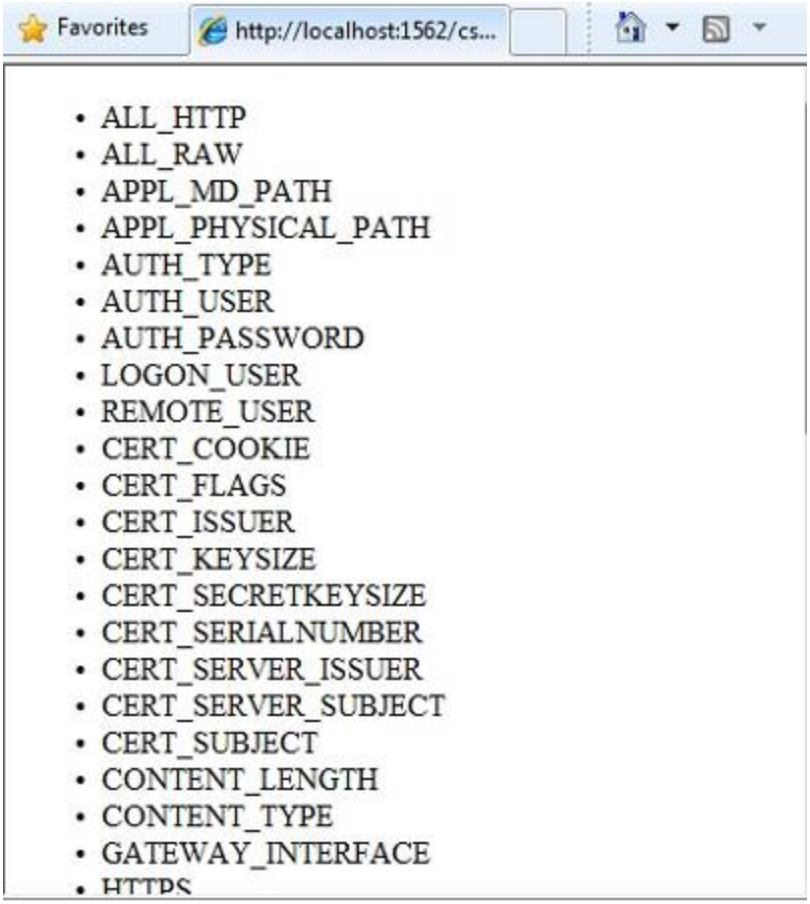


If you're working with a collection or array, you often use a `foreach` loop. A collection is a group of similar objects, and the `foreach` loop lets you carry out a task on each item in the collection. This type of loop is convenient for collections, because unlike a `for` loop, you don't have to increment the counter or set a limit. Instead, the `foreach` loop code simply proceeds through the collection until it's finished.

This example returns the items in the `Request.ServerVariables` collection that (which is an object that contains information about your web server). It uses a `foreach` loop to display the name of each item by creating a new `<li>` element in an HTML bulleted list.

```
<ul>
@foreach (var myItem in Request.ServerVariables)
{
    <li>@myItem</li>
}
</ul>
```

The `foreach` keyword is followed by parentheses where you declare a variable that represents a single item in the collection (in the example, `var item`), followed by the `in` keyword, followed by the collection you want to loop through. In the body of the `foreach` loop, you can access the current item using the variable that you declared earlier.



To create a more general-purpose loop, use the `while` statement:

```
@{
    var countNum = 0;
    while (countNum < 50)
    {
        countNum += 1;
        <p>Line #@countNum: </p>
    }
}
```

A `while` loop begins with the `while` keyword, followed by parentheses where you specify how long the loop continues (here, for as long as `countNum` is less than 50), then the block to repeat. Loops typically increment (add to) or decrement (subtract from) a variable or object used for counting. In the example, the `+=` operator adds 1 to `countNum` each time the loop runs. (To decrement a variable in a loop that counts down, you would use the decrement operator `-=`).

Objects and Collections

Nearly everything in an ASP.NET website is an object, including the web page itself. This section discusses some important objects you'll work with frequently in your code.

Page Objects

The most basic object in ASP.NET is the page. You can access properties of the page object directly without any qualifying object. The following code gets the page's file path, using the `Request` object of the page:

```
@{
    var path = Request.FilePath;
}
```

To make it clear that you're referencing properties and methods on the current page object, you can optionally use the keyword `this` to represent the page object in your code. Here is the previous code example, with `this` added to represent the page:

```
@{
    var path = this.Request.FilePath;
}
```

You can use properties of the `Page` object to get a lot of information, such as:

- `Request`. As you've already seen, this is a collection of information about the current request, including what type of browser made the request, the URL of the page, the user identity, etc.
- `Response`. This is a collection of information about the response (page) that will be sent to the browser when the server code has finished running. For example, you can use this property to write information into the response.

  ```
  @{
      // Access the page's Request object to retrieve the Url.
      var pageUrl = this.Request.Url;
  }
  <a href="@pageUrl">My page</a>
  ```

Collection Objects (Arrays and Dictionaries)

A *collection* is a group of objects of the same type, such as a collection of `Customer` objects from a database. ASP.NET contains many built-in collections, like the `Request.Files` collection.

You'll often work with data in collections. Two common collection types are the *array* and the *dictionary*. An array is useful when you want to store a collection of similar items but don't want to create a separate variable to hold each item:

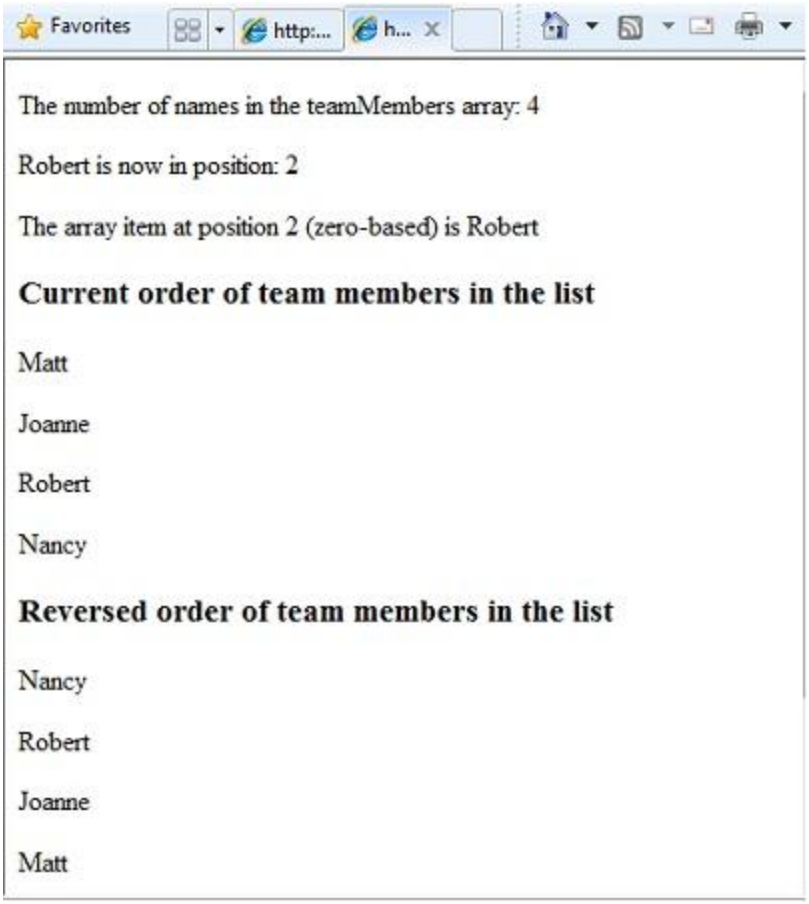
```
@* Array block 1: Declaring a new array using braces. *@
@{
    <h3>Team Members</h3>
    string[] teamMembers = {"Matt", "Joanne", "Robert", "Nancy"};
    foreach (var person in teamMembers)
    {
        <p>@person</p>
    }
}
```

With arrays, you declare a specific data type, such as `string`, `int`, or `DateTime`. To indicate that the variable can contain an array, you add brackets to the declaration (such as `string[]` or `int[]`). You can access items in an array using their position (index) or by using the `foreach` statement. Array indexes are zero-based — that is, the first item is at position 0, the second item is at position 1, and so on.

```
@{
    string[] teamMembers = {"Matt", "Joanne", "Robert", "Nancy"};
    <p>The number of names in the teamMembers array: @teamMembers.Length </p>
    <p>Robert is now in position: @Array.IndexOf(teamMembers, "Robert")</p>
    <p>The array item at position 2 (zero-based) is @teamMembers[2]</p>
    <h3>Current order of team members in the list</h3>
    foreach (var name in teamMembers)
    {
        <p>@name</p>
    }
    <h3>Reversed order of team members in the list</h3>
    Array.Reverse(teamMembers);
    foreach (var reversedItem in teamMembers)
    {
        <p>@reversedItem</p>
    }
}
```

You can determine the number of items in an array by getting its `Length` property. To get the position of a specific item in the array (to search the array), use the `Array.IndexOf` method. You can also do things like reverse the contents of an array (the `Array.Reverse` method) or sort the contents (the `Array.Sort` method).

The output of the string array code displayed in a browser:



A dictionary is a collection of key/value pairs, where you provide the key (or name) to set or retrieve the corresponding value:

```
@{
    var myScores = new Dictionary<string, int>();
    myScores.Add("test1", 71);
    myScores.Add("test2", 82);
    myScores.Add("test3", 100);
    myScores.Add("test4", 59);
}
<p>My score on test 3 is: @myScores["test3"]%</p>
@(myScores["test4"] = 79)
<p>My corrected score on test 4 is: @myScores["test4"]%</p>
```

To create a dictionary, you use the `new` keyword to indicate that you're creating a new dictionary object. You can assign a dictionary to a variable using the `var` keyword. You indicate the data types of the items in the dictionary using angle brackets (< >). At the end of the declaration, you must add a pair of parentheses, because this is actually a method that creates a new dictionary.

To add items to the dictionary, you can call the `Add` method of the dictionary variable (`myScores` in this case), and then specify a key and a value. Alternatively, you can use square brackets to indicate the key and do a simple assignment, as in the following example:

```
myScores["test4"] = 79;
```

To get a value from the dictionary, you specify the key in brackets:

```
var testScoreThree = myScores["test3"];
```

Calling Methods with Parameters

As you read earlier in this chapter, the objects that you program with can have methods. For example, a `Database` object might have a `Database.Connect` method. Many methods also have one or more parameters. A *parameter* is a value that you pass to a method to enable the method to complete its task. For example, look at a declaration for the `Request.MapPath` method, which takes three parameters:

```
public string MapPath(string virtualPath, string baseVirtualDir, bool allowCrossAppMapping);
```

This method returns the physical path on the server that corresponds to a specified virtual path. The three parameters for the method are `virtualPath`, `baseVirtualDir`, and `allowCrossAppMapping`. (Notice that in the declaration, the parameters are listed with the data types of the data that they'll accept.) When you call this method, you must supply values for all three parameters.

The Razor syntax gives you two options for passing parameters to a method: *positional parameters* and *named* parameters. To call a method using positional parameters, you pass the parameters in a strict order that's specified in the method declaration. (You would typically know this order by reading documentation for the method.) You must follow the order, and you can't skip any of the parameters — if necessary, you pass an empty string (`""`) or `null` for a positional parameter that you don't have a value for.

The following example assumes you have a folder named *scripts* on your website. The code calls the `Request.MapPath` method and passes values for the three parameters in the correct order. It then displays the resulting mapped path.

```
// Pass parameters to a method using positional parameters.
var myPathPositional = Request.MapPath("/scripts", "/", true);
<p>@myPathPositional</p>
```

When a method has many parameters, you can keep your code more readable by using named parameters. To call a method using named parameters, you specify the parameter name followed by a colon (:), and then the value. The advantage of named parameters is that you can pass them in any order you want. (A disadvantage is that the method call is not as compact.)

The following example calls the same method as above, but uses named parameters to supply the values:

```
// Pass parameters to a method using named parameters.
var myPathNamed = Request.MapPath(baseVirtualDir: "/", allowCrossAppMapping: true,
virtualPath: "/scripts");
<p>@myPathNamed</p>
```

As you can see, the parameters are passed in a different order. However, if you run the previous example and this example, they'll return the same value.

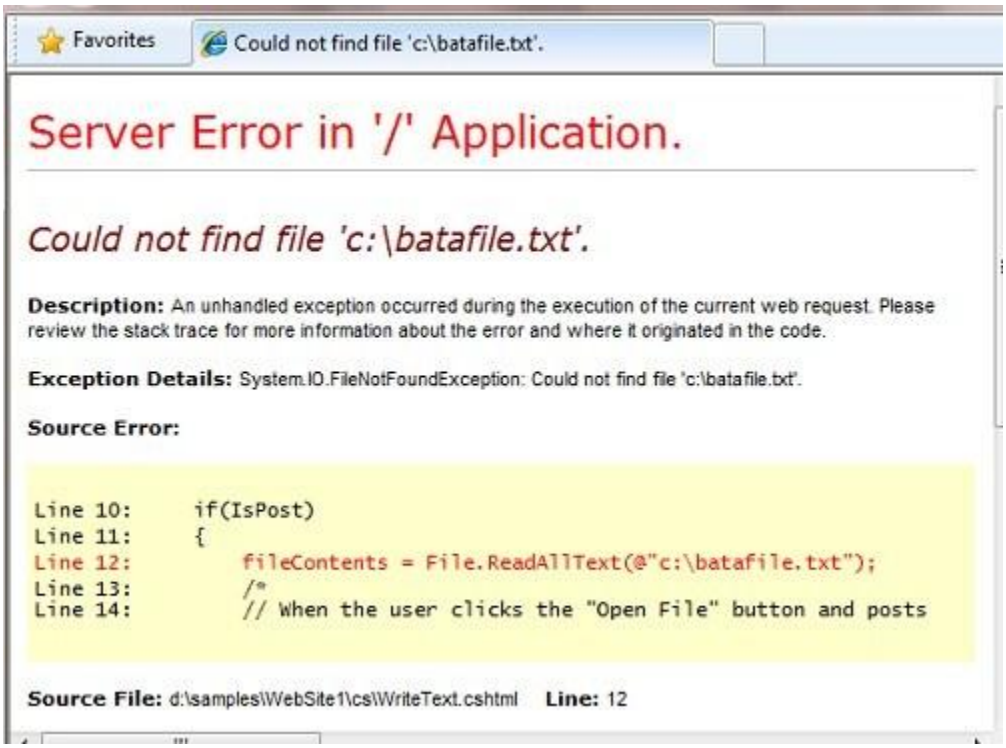
Handling Errors

Try-Catch Statements

You'll often have statements in your code that might fail for reasons outside your control. For example:

- If your code tries to open, create, read, or write a file, all sorts of errors might occur. The file you want might not exist, it might be locked, the code might not have permissions, and so on.
- Similarly, if your code tries to update records in a database, there can be permissions issues, the connection to the database might be dropped, the data to save might be invalid, and so on.

In programming terms, these situations are called *exceptions*. If your code encounters an exception, it generates (throws) an error message that's, at best, annoying to users:



In situations where your code might encounter exceptions, and in order to avoid error messages of this type, you can use `try/catch` statements. In the `try` statement, you run the code that you're checking. In one or more `catch` statements, you can look for specific errors (specific types of exceptions) that might have occurred. You can include as many `catch` statements as you need to look for errors that you are anticipating.

Note We recommend that you avoid using the `Response.Redirect` method in `try/catch` statements, because it can cause an exception in your page.

The following example shows a page that creates a text file on the first request and then displays a button that lets the user open the file. The example deliberately uses a bad file name so that it will cause an exception. The code includes `catch` statements for two possible exceptions: `FileNotFoundException`, which occurs if the file name is bad, and `DirectoryNotFoundException`, which occurs if ASP.NET can't even find the folder. (You can uncomment a statement in the example in order to see how it runs when everything works properly.)

If your code didn't handle the exception, you would see an error page like the previous screen shot. However, the `try/catch` section helps prevent the user from seeing these types of errors.

```
@{
    var dataFilePath = "~/dataFile.txt";
    var fileContents = "";
    var physicalPath = Server.MapPath(dataFilePath);
    var userMessage = "Hello world, the time is " + DateTime.Now;
    var userErrMsg = "";
    var errMsg = "";

    if(IsPost)
    {
        // When the user clicks the "Open File" button and posts
        // the page, try to open the created file for reading.
        try {
            // This code fails because of faulty path to the file.
            fileContents = File.ReadAllText(@"c:\batafile.txt");

            // This code works. To eliminate error on page,
            // comment the above line of code and uncomment this one.
            //fileContents = File.ReadAllText(physicalPath);
        }
        catch (FileNotFoundException ex) {
            // You can use the exception object for debugging, logging, etc.
            errMsg = ex.Message;
            // Create a friendly error message for users.
            userErrMsg = "A file could not be opened, please contact "
                + "your system administrator.";
        }
        catch (DirectoryNotFoundException ex) {
            // Similar to previous exception.
            errMsg = ex.Message;
            userErrMsg = "A directory was not found, please contact "
                + "your system administrator.";
        }
    }
    else
    {
        // The first time the page is requested, create the text file.
        File.WriteAllText(physicalPath, userMessage);
    }
}
```

```
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8" />
        <title>Try-Catch Statements</title>
    </head>
    <body>
    <form method="POST" action="" >
      <input type="Submit" name="Submit" value="Open File"/>
    </form>

    <p>@fileContents</p>
    <p>@userErrMsg</p>

    </body>
</html>
```

Additional Resources

Programming with Visual Basic

- Appendix: Visual Basic Language and Syntax

Reference Documentation

- ASP.NET
- C# Language

Chapter 3 – Creating a Consistent Look

To make it more efficient to create web pages for your site, you can create reusable blocks of content (like headers and footers) for your website, and you can create a consistent layout for all the pages.

What you'll learn

- How to create reusable blocks of content like headers and footers.
- How to create a consistent look for all the pages in your site using a layout page.
- How to pass data at run time to a layout page.
- How to create and use a simple helper.

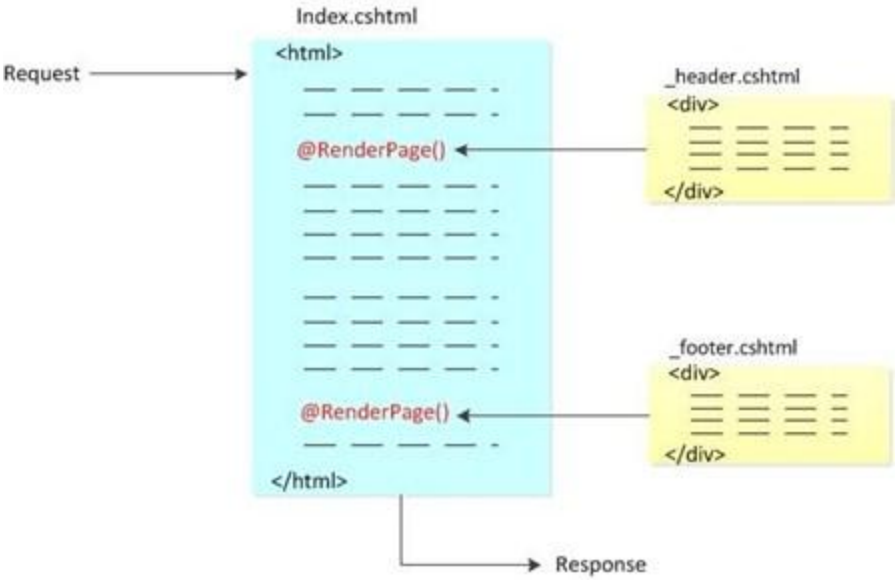
These are the ASP.NET features introduced in the chapter:

- Content blocks, which are files that contain HTML-formatted content to be inserted in multiple pages.
- Layout pages, which are pages that contain HTML-formatted content that can be shared by pages on the website.
- The `RenderPage`, `RenderBody`, and `RenderSection` methods, which tell ASP.NET where to insert page elements.
- The `PageData` dictionary that lets you share data between content blocks and layout pages.

Creating Reusable Blocks of Content

Many websites have content that's displayed on every page, like a header and footer, or a box that tells users that they're logged in. ASP.NET lets you create a separate file with a content block that can contain text, markup, and code, just like a regular web page. You can then insert the content block in other pages on the site where you want the information to appear. That way you don't have to copy and paste the same content into every page. Creating common content like this also makes it easier to update your site. If you need to change the content, you can just update a single file, and the changes are then reflected everywhere the content has been inserted.

The following diagram shows how content blocks work. When a browser requests a page from the web server, ASP.NET inserts the content blocks at the point where the `RenderPage` method is called in the main page. The finished (merged) page is then sent to the browser.



In this procedure, you'll create a page that references two content blocks (a header and a footer) that are located in separate files. You can use these same content blocks in any page in your site. When you're done, you'll get a page like this:

1. In the root folder of your website, create a file named *Index.cshtml*.
2. Replace the existing markup with the following:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Main Page</title>
  </head>
  <body>

    <h1>Index Page Content</h1>
    <p>This is the content of the main page.</p>

  </body>
</html>
```

3. In the root folder, create a folder named *Shared*.

> **Note** It's common practice to store files that are shared among web pages in a folder named *Shared*.

4. In the *Shared* folder, create a file named *_Header.cshtml*.
5. Replace any existing content with the following:

```
<div class="header">This is header text.</div>
```

Notice that the file name is *_Header.cshtml*, with an underscore (_) as a prefix. ASP.NET won't send a page to the browser if its name starts with an underscore. This prevents people from requesting (inadvertently or otherwise) these pages. It's a good idea to use an underscore to name pages that have content blocks in them, because you don't really want users to be able to request these pages — they exist strictly to be inserted into other pages.

6. In the *Shared* folder, create a file named *_Footer.cshtml* and replace the content with the following:

```
<div class="footer">&copy; 2010 Contoso Pharmaceuticals. All rights reserved.
</div>
```

7. In the *Index.cshtml* page, add the following highlighted code, which makes two calls to the `RenderPage` method:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Main Page</title>
  </head>
  <body>

    @RenderPage("/Shared/_Header.cshtml")

    <h1>Index Page Content</h1>
    <p>This is the content of the main page.</p>

    @RenderPage("/Shared/_Footer.cshtml")

  </body>
</html>
```

This shows how to insert a content block into a web page. You call the `RenderPage` method and pass it the name of the file whose contents you want to insert at that point. Here, you're inserting the contents of the *_Header.cshtml* and *_Footer.cshtml* files into the *Index.cshtml* file.

8. Run the *Index.cshtml* page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.)
9. In the browser, view the page source. (For example, in Internet Explorer, right-click the page and then click **View Source**.)

This lets you see the web page markup that's sent to the browser, which combines the index page markup with the content blocks. The following example shows the page source that's rendered for *Index.cshtml*. The calls to `RenderPage` that you inserted into *Index.cshtml* have been replaced with the actual contents of the header and footer files.

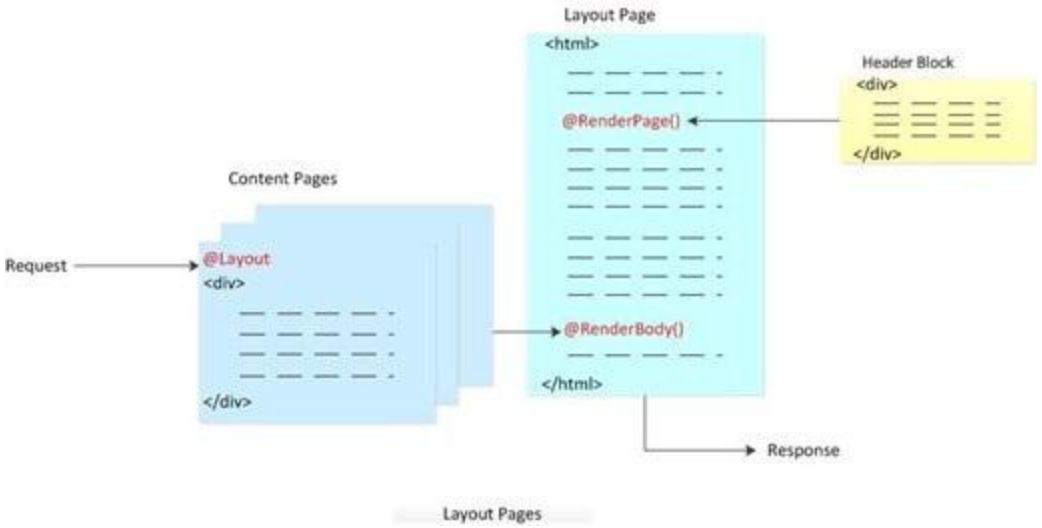
```
<!DOCTYPE html>
<html>
  <head>
    <title>Main Page</title>
  </head>
  <body>

  <div class="header">
    This is header text.
  </div>

    <h1>Index Page Content</h1>
    <p>This is the content of the main page.</p>

  <div class="footer">
    &copy; 2010 Contoso Pharmaceuticals. All rights reserved.
  </div>

  </body>
</html>
```

Creating a Consistent Look Using Layout Pages

So far you've seen that it's easy to include the same content on multiple pages. A more structured approach to creating a consistent look for a site is to use layout pages. A layout page defines the structure of a web page, but doesn't contain any actual content. After you've created a layout page, you can create web pages that contain the content and then link them to the layout page. When these pages are displayed, they'll be formatted according to the layout page. (In this sense, a layout page acts as a kind of template for content that's defined in other pages.)

The layout page is just like any HTML page, except that it contains a call to the `RenderBody` method. The position of the `RenderBody` method in the layout page determines where the information from the content page will be included.

The following diagram shows how content pages and layout pages are combined at run time to produce the finished web page. The browser requests a content page. The content page has code in it that specifies the layout page to use for the page's structure. In the layout page, the content is inserted at the point where the `RenderBody` method is called. Content blocks can also be inserted into the layout page by calling the `RenderPage` method, the way you did in the previous section. When the web page is complete, it's sent to the browser.



The following procedure shows how to create a layout page and link content pages to it.

1. In the *Shared* folder of your website, create a file named *_Layout1.cshtml*.
2. Replace any existing content with the following:

```
<!DOCTYPE html>
  <head>
    <title> Structured Content </title>
    <link href="@Href("/Styles/Site.css")" rel="stylesheet" type="text/css" />
  </head>
  <body>
    @RenderPage("/Shared/_Header2.cshtml")
    <div id="main">
      @RenderBody()
    </div>
    <div id="footer">
      &copy; 2010 Contoso Pharmaceuticals. All rights reserved.
    </div>
  </body>
</html>
```

   You use the `RenderPage` method in a layout page to insert content blocks. A layout page can contain only one call to the `RenderBody` method.

> **Note** Web servers don't all handle hyperlink references (the `href` attribute of links) in the same way. Therefore, ASP.NET provides the `@Href` helper, which accepts a path and provides the path to the web server in the form that the web server expects.

3. In the *Shared* folder, create a file named *_Header2.cshtml* and replace any existing content with the following:

```
<div id="header">Chapter 3: Creating a Consistent Look</div>
```

4. In the root folder, create a new folder and name it *Styles*.

5. In the *Styles* folder, create a file named *Site.css* and add the following style definitions:

```
h1 {
    border-bottom: 3px solid #cc9900;
    font: 2.75em/1.75em Georgia, serif;
    color: #996600;
}

ul {
    list-style-type: none;
}

body {
    margin: 0;
    padding: 1em;
    background-color: #ffffff;
    font: 75%/1.75em "Trebuchet MS", Verdana, sans-serif;
    color: #006600;
}

#list {
    margin: 1em 0 7em -3em;
    padding: 1em 0 0 0;
    background-color: #ffffff;
    color: #996600;
    width: 25%;
    float: left;
}

#header, #footer {
    margin: 0;
    padding: 0;
    color: #996600;
}
```

   These style definitions are here only to show how style sheets can be used with layout pages. If you want, you can define your own styles for these elements.

6. In the root folder, create a file named *Content1.cshtml* and replace any existing content with the following:

```
@{
    Layout = "/Shared/_Layout1.cshtml";
}

<h1> Structured Content </h1>
<p>Lorem ipsum dolor sit amet, consectetur adipisicing elit,
sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris
nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in
reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla
pariatur. Excepteur sint occaecat cupidatat non proident, sunt in
culpa qui officia deserunt mollit anim id est laborum.</p>
```

This is a page that will use a layout page. The code block at the top of the page indicates which layout page to use to format this content.

7. Run *Content1.cshtml* in a browser. The rendered page uses the format and style sheet defined in *_Layout1.cshtml* and the text (content) defined in *Content1.cshtml*.

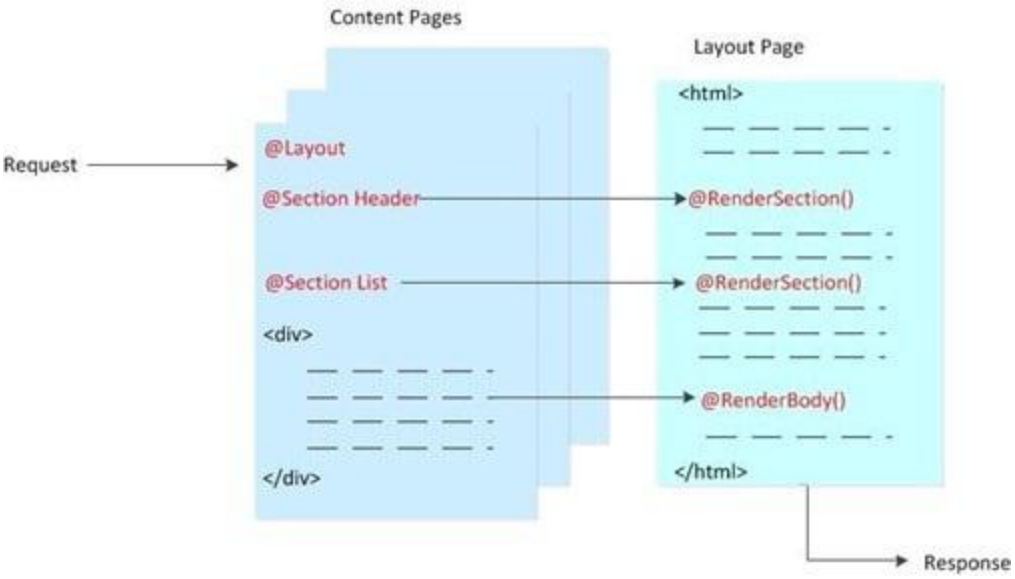
You can repeat step 6 to create additional content pages that can then share the same layout page.

> **Note** You can set up your site so that you can automatically use the same layout page for all the content pages in a folder. For details, see Chapter 18 - Customizing Site-Wide Behavior.

Designing Layout Pages That Have Multiple Content Sections

A content page can have multiple sections, which is useful if you want to use layouts that have multiple areas with replaceable content. In the content page, you give each section a unique name. (The default section is left unnamed.) In the layout page, you add a `RenderBody` method to specify where the unnamed (default) section should appear. You then add separate `RenderSection` methods in order to render named sections individually.

The following diagram shows how ASP.NET handles content that's divided into multiple sections. Each named section is contained in a section block in the content page. (They're named `Header` and `List` in the example.) The framework inserts content section into the layout page at the point where the `RenderSection` method is called. The unnamed (default) section is inserted at the point where the `RenderBody` method is called, as you saw earlier.



This procedure shows how to create a content page that has multiple content sections and how to render it using a layout page that supports multiple content sections.

1. In the *Shared* folder, create a file named *_Layout2.cshtml*.
2. Replace any existing content with the following:

```
<!DOCTYPE html>
<html>
    <head>
      <title>Multisection Content</title>
      <link href="@Href("/Styles/Site.css")" rel="stylesheet" type="text/css" />
    </head>
    <body>
      <div id="header">
        @RenderSection("header")
      </div>
      <div id="list">
        @RenderSection("list")
      </div>
      <div id="main">
        @RenderBody()
      </div>
      <div id="footer">
        &copy; 2010 Contoso Pharmaceuticals. All rights reserved.
      </div>
    </body>
</html>
```

   You use the `RenderSection` method to render both the header and list sections.

3. In the root folder, create a file named *Content2.cshtml* and replace any existing content with the following:

```
@{
```

```
    Layout = "/Shared/_Layout2.cshtml";
}

@section header {
    <div id="header">
        Chapter 3: Creating a Consistent Look
    </div>
}

@section list {
    <ul>
        <li>Lorem</li>
        <li>Ipsum</li>
        <li>Dolor</li>
        <li>Consecte</li>
        <li>Eiusmod</li>
        <li>Tempor</li>
        <li>Incididu</li>
    </ul>
}

<h1>Multisection Content</h1>
<p>Lorem ipsum dolor sit amet, consectetur adipisicing elit,
sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris
nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in
reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla
pariatur. Excepteur sint occaecat cupidatat non proident, sunt in
culpa qui officia deserunt mollit anim id est laborum.</p>
```

This content page contains a code block at the top of the page. Each named section is contained in a section block. The rest of the page contains the default (unnamed) content section.

4. Run the page in a browser.

Making Content Sections Optional

Normally, the sections that you create in a content page have to match sections that are defined in the layout page. You can get errors if any of the following occur:

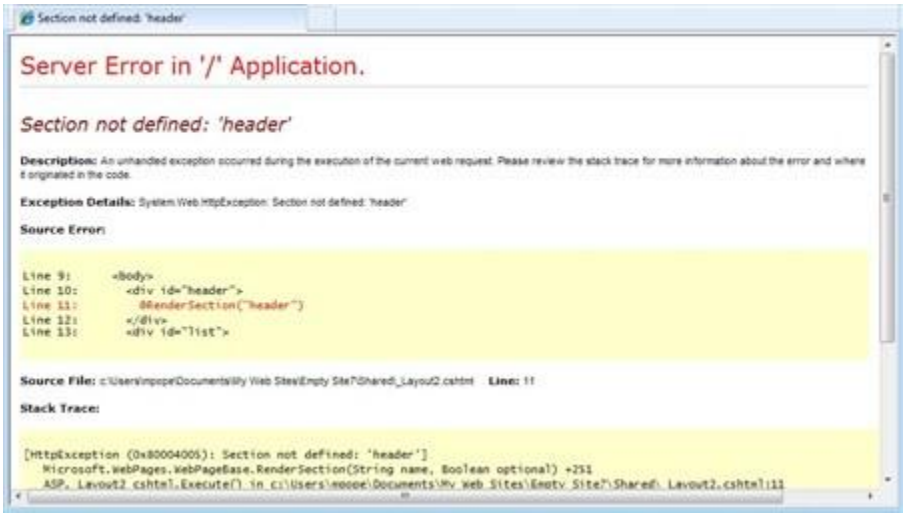
- The content page contains a section that has no corresponding section in the layout page.
- The layout page contains a section for which there's no content.
- The layout page includes method calls that try to render the same section more than once.

However, you can override this behavior for a named section by declaring the section to be optional in the layout page. This lets you define multiple content pages that can share a layout page but that might or might not have content for a specific section.

1. Open *Content2.cshtml* and remove the following section:

```
@section header {
  <div id="header">
    Chapter 3: Creating a Consistent Look
  </div>
}
```

2. Save the page and then run it in a browser. An error message is displayed, because the content page doesn't provide content for a section defined in the layout page, namely the header section.



3. In the *Shared* folder, open the *_Layout2.cshtml* page and replace this line:

```
@RenderSection("header")
```

with the following code:

```
@RenderSection("header", required: false)
```

As an alternative, you could replace the previous line of code with the following code block, which produces the same results:

```
@if (IsSectionDefined("header")) {
    @RenderSection("header")
}
```

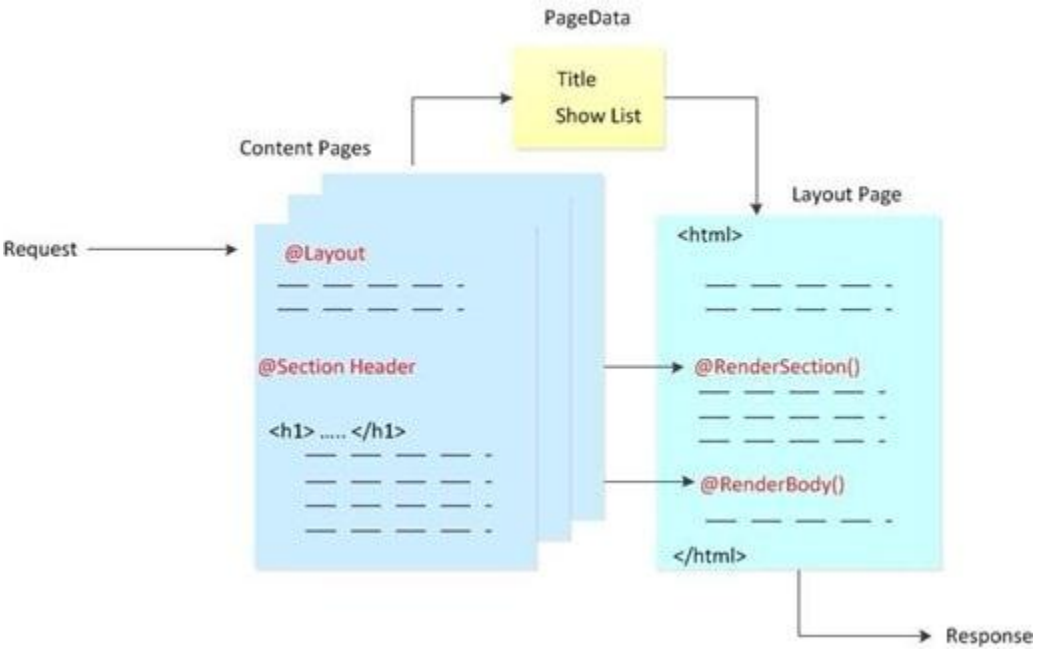
4. Run the *Content2.cshtml* page in a browser again. (If you still have this page open in the browser, you can just refresh it.) This time the page is displayed with no error, even though it has no header.

Passing Data to Layout Pages

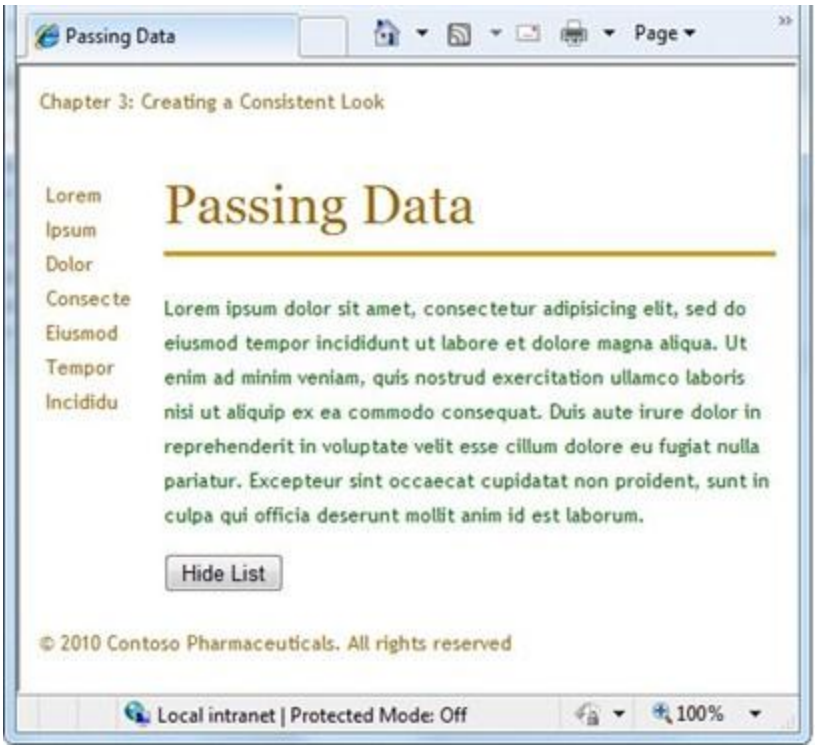
You might have data defined in the content page that you need to refer to in a layout page. If so, you need to pass the data from the content page to the layout page. For example, you might want to display the login status of a user, or you might want to show or hide content areas based on user input.

To pass data from a content page to a layout page, you can put values into the `PageData` property of the content page. The `PageData` property is a collection of name/value pairs that hold the data that you want to pass between pages. In the layout page, you can then read values out of the `PageData` property.

Here's another diagram. This one shows how ASP.NET can use the `PageData` property to pass values from a content page to the layout page. When ASP.NET begins building the web page, it creates the `PageData` collection. In the content page, you write code to put data in the `PageData` collection. Values in the `PageData` collection can also be accessed by other sections in the content page or by additional content blocks.



The following procedure shows how to pass data from a content page to a layout page. When the page runs, it displays a button that lets the user hide or show a list that's defined in the layout page. When users click the button, it sets a true/false (Boolean) value in the `PageData` property. The layout page reads that value, and if it's false, hides the list. The value is also used in the content page to determine whether to display the **Hide List** button or the **Show List** button.



1. In the root folder, create a file named *Content3.cshtml* and replace any existing content with the following:

```
@{
    Layout = "/Shared/_Layout3.cshtml";

    PageData["Title"] = "Passing Data";
    PageData["ShowList"] = true;

    if (IsPost) {
        if (Request["list"] == "off") {
            PageData["ShowList"] = false;
        }
    }
}

@section header {
    <div id="header">
        Chapter 3: Creating a Consistent Look
    </div>
}

<h1>@PageData["Title"]</h1>
<p>Lorem ipsum dolor sit amet, consectetur adipisicing elit,
```

```
sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.
Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris
nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in
reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla
pariatur. Excepteur sint occaecat cupidatat non proident, sunt in
culpa qui officia deserunt mollit anim id est laborum.</p>

@if (PageData["ShowList"] == true) {
    <form method="post" action="">
      <input type="hidden" name="list" value="off" />
      <input type="submit" value="Hide List" />
    </form>
}
else {
    <form method="post" action="">
      <input type="hidden" name="list" value="on" />
      <input type="submit" value="Show List" />
    </form>
}
```

The code stores two pieces of data in the `PageData` property — the title of the web page and true or false to specify whether to display a list.

Notice that ASP.NET lets you put HTML markup into the page conditionally using a code block. For example, the `if/else` block in the body of the page determines which form to display depending on whether `PageData["ShowList"]` is set to true.

2. In the *Shared* folder, create a file named *_Layout3.cshtml* and replace any existing content with the following:

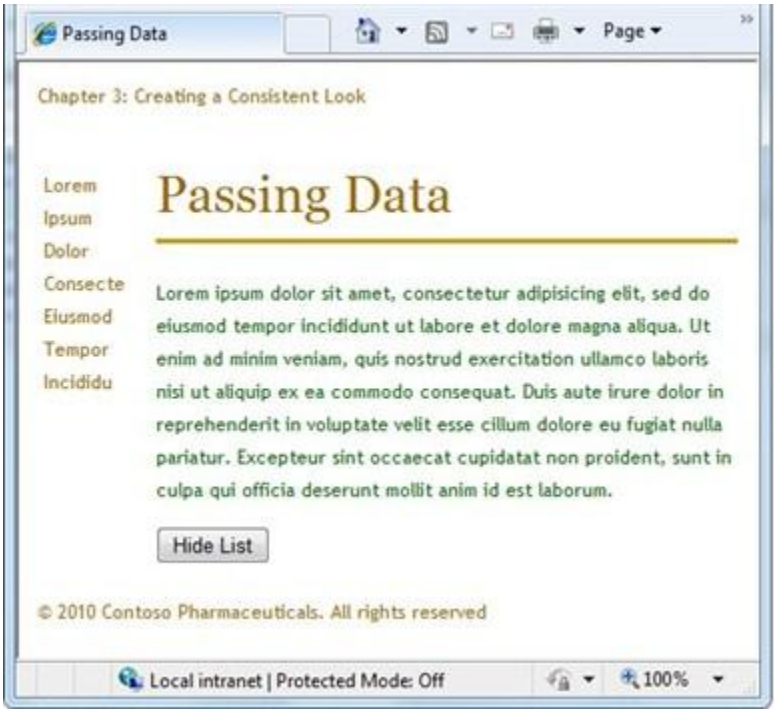
```
<!DOCTYPE html>

<html>
    <head>
      <title>@PageData["Title"]</title>
      <link href="@Href("/Styles/Site.css")" rel="stylesheet" type="text/css" />
    </head>
    <body>
      <div id="header">
        @RenderSection("header")
      </div>
      @if (PageData["ShowList"] == true) {
          <div id="list">
            @RenderPage("/Shared/_List.cshtml")
          </div>
      }
      <div id="main">
        @RenderBody()
      </div>
      <div id="footer">
        &copy; 2010 Contoso Pharmaceuticals. All rights reserved.
      </div>
    </body>
</html>
```

The layout page includes an expression in the `<title>` element that gets the title value from the `PageData` property. It also uses the `ShowList` value of the `PageData` property to determine whether to display the list content block.

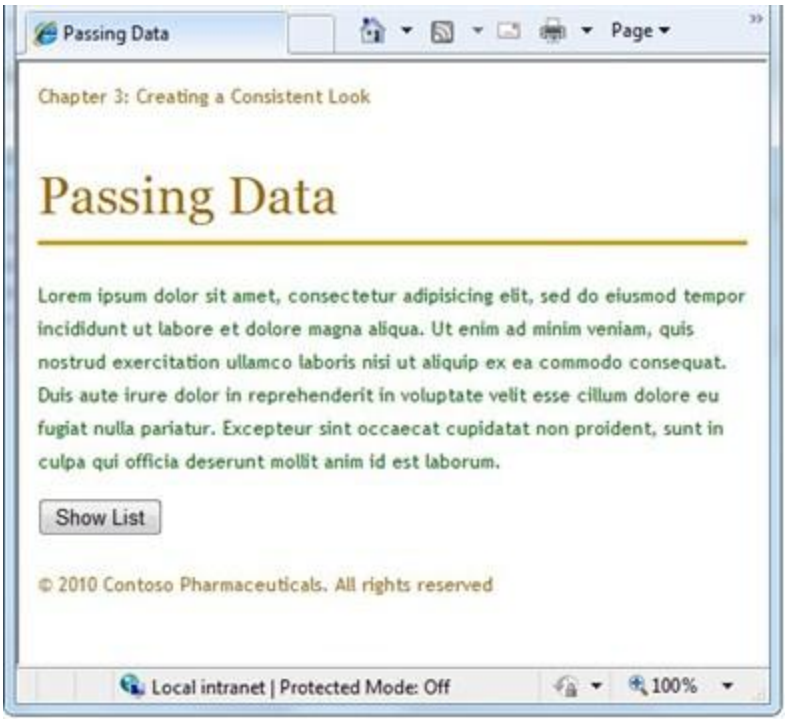
3. In the *Shared* folder, create a file named *_List.cshtml* and replace any existing content with the following:

```
<ul>
  <li>Lorem</li>
  <li>Ipsum</li>
  <li>Dolor</li>
  <li>Consecte</li>
  <li>Eiusmod</li>
  <li>Tempor</li>
  <li>Incididu</li>
</ul>
```

4. Run the *Content3.cshtml* page in a browser. The page is displayed with the list visible on the left side of the page and a **Hide List** button at the bottom.



5. Click **Hide List**. The list disappears and the button changes to **Show List**.



6. Click the **Show List** button, and the list is displayed again.

Creating and Using a Basic Helper

Another option for creating a consistent look in your website is to create a custom helper. As you learned in Chapter 1 - Getting Started with ASP.NET Web Pages, a helper is a component that lets you accomplish a task using a single line of code. ASP.NET includes many helpers, and you'll work with many of them in later chapters. A complete list of helpers is listed in the ASP.NET API Quick Reference.

A helper can help you create a consistent look on your website by letting you use a common block of code across multiple pages. Suppose that in your page you often want to create a note item that's set apart from normal paragraphs, which you create using a `<div>` element that's styled as a box with a border. Rather than add the same markup to every page, you can package it as a helper, and then insert the note with a single line of code anywhere you need it. This makes the code in each of your pages simpler and easier to read. It also makes it easier to maintain your site, because if you need to change how the notes look, you can change the markup in one place.

This procedure shows you how to create a helper that creates the note, as just described. This is a simple example, but the custom helper can include any markup and ASP.NET code that you need.

1. In the root folder of the website, create a folder named *App_Code*.
2. In the *App_Code* folder create a new *.cshtml* file and name it *MyHelpers.cshtml*.
3. Replace the existing content with the following:

```
@helper MakeNote(string content) {
```

```
    <div class="note" style="border: 1px solid black; width: 90%; padding: 5px; margin-
left: 15px;">
      <p>
          <strong>Note</strong>   @content
       </p>
    </div>
}
```

The code uses the `@helper` syntax to declare a new helper named `MakeNote`. This particular helper lets you pass a parameter named `content` that can contain a combination of text and markup. The helper inserts the string into the note body using the `@content` variable.

Notice that the file is named *MyHelpers.cshtml*, but the helper is named `MakeNote`. You can put multiple custom helpers into a single file.

4. Save and close the file.

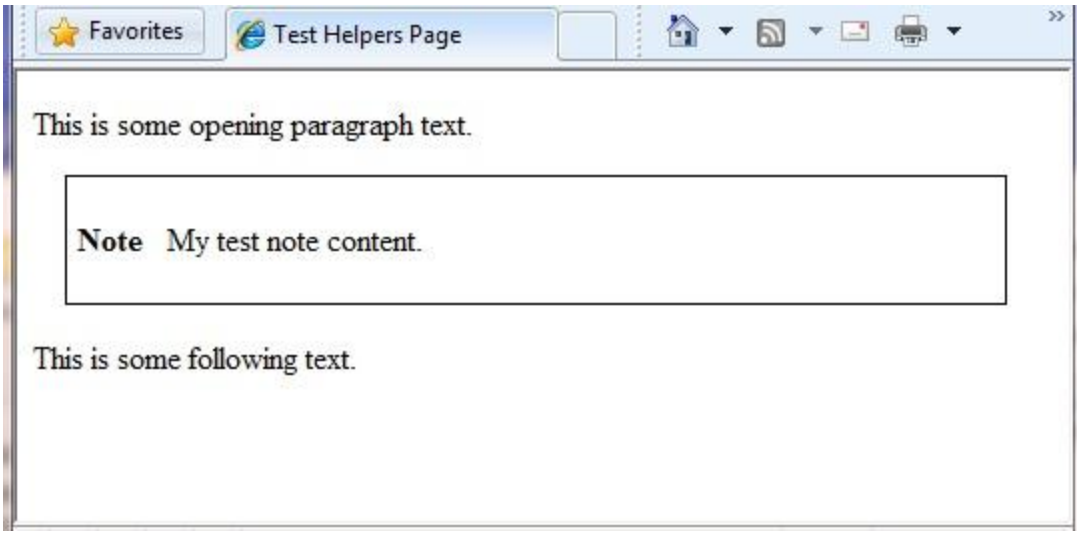
The next procedure shows how to use the helper you created to insert a note item into a web page.

1. In the root folder, create a new blank file called *TestHelper.cshtml*.
2. Add the following code to the file:

```
<!DOCTYPE html>
  <head>
    <title>Test Helpers Page</title>
  </head>
  <body>
    <p>This is some opening paragraph text.</p>

    <!-- Insert the call to your note helper here. -->
    @MyHelpers.MakeNote("My test note content.")

    <p>This is some following text.</p>
  </body>
</html>
```

To call the helper you created, use `@` followed by the file name where the helper is, a dot, and then the helper name. (If you had multiple folders in the *App_Code* folder, you could use the syntax *@FolderName.FileName.HelperName* to call your helper within any nested folder level). The text that you add in quotation marks within the parentheses is the text that the helper will display as part of the note in the web page.

3. Save the page and run it in a browser. The helper generates the note item right where you called the helper: between the two paragraphs.



Additional Resources

- Chapter 18 - Customizing Site-Wide Behavior

Chapter 4 – Working with Forms

A form is a section of an HTML document where you put user-input controls, like text boxes, check boxes, radio buttons, and pull-down lists. You use forms when you want to collect and process user input.

What you'll learn

- How to create an HTML form.
- How to read user input from the form.
- How to validate user input.
- How to restore form values after the page is submitted.

These are the ASP.NET programming concepts introduced in the chapter:

- The `Request` object.
- Input validation.
- HTML encoding.

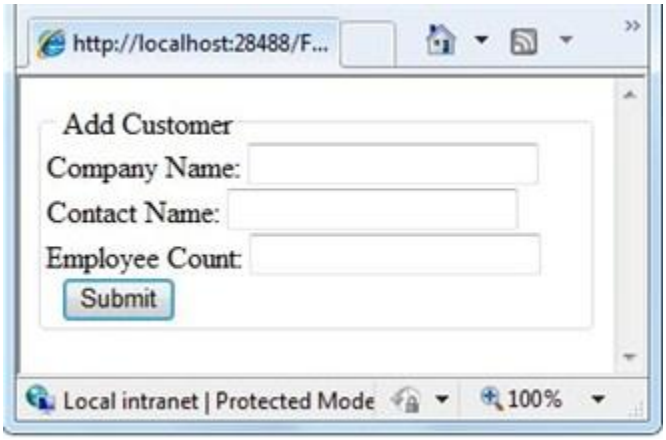
Creating a Simple HTML Form

1. Create a new website.
2. In the root folder, create a web page named *Form.cshtml* and enter the following markup:

```
<!DOCTYPE html>
<html>
    <head>
        <title>Customer Form</title>
    </head>
    <body>
      <form method="post" action="">
        <fieldset>
          <legend>Add Customer</legend>
          <div>
            <label for="CompanyName">Company Name:</label>
            <input type="text" name="CompanyName" value="" />
          </div>
          <div>
            <label for="ContactName">Contact Name:</label>
            <input type="text" name="ContactName" value="" />
          </div>
          <div>
            <label for="Employees">Employee Count:</label>
            <input type="text" name="Employees" value="" />
          </div>
          <div>
            <label> </label>
            <input type="submit" value="Submit" class="submit" />
          </div>
        </fieldset>
```

```
      </form>
    </body>
</html>
```

3. Launch the page in your browser. (Make sure the page is selected in the **Files** workspace before you run it.) A simple form with three input fields and a **Submit** button is displayed.



At this point, if you click the **Submit** button, nothing happens. To make the form useful, you have to add some code that will run on the server.

Reading User Input From the Form

To process the form, you add code that reads the submitted field values and does something with them. This procedure shows you how to read the fields and display the user input on the page. (In a production application, you generally do more interesting things with user input. You'll do that in the chapter about working with databases.)

1. At the top of the *Form.cshtml* file, enter the following code:

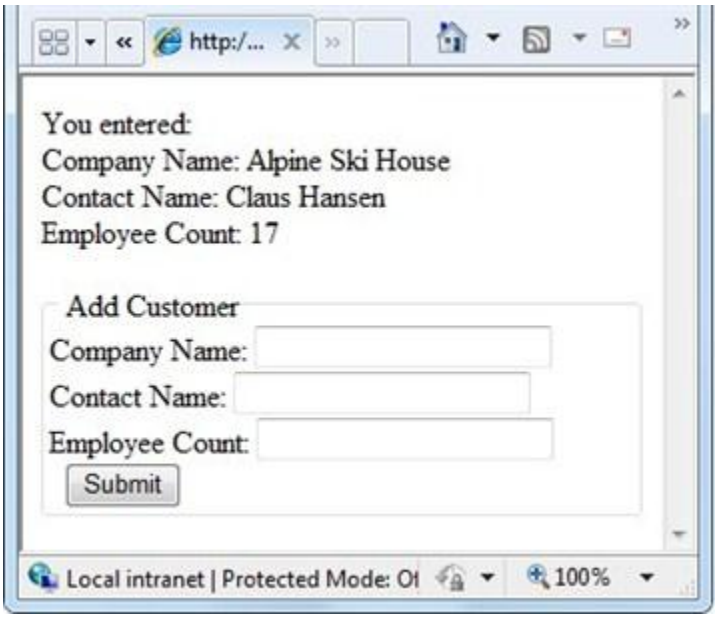
```
@{
    if (IsPost) {
        string companyname = Request["companyname"];
        string contactname = Request["contactname"];
        int employeecount = Request["employees"].AsInt();

        <text>
          You entered: <br />
          Company Name: @companyname <br />
          Contact Name: @contactname <br />
          Employee Count: @employeecount <br />
        </text>
    }
}
```

The way this page works, when the user first requests the page, only the empty form is displayed. The user (which will be you) fills in the form and then clicks **Submit**. This submits

(posts) the user input to the server. The request goes to the same page (namely, *Form.cshtml*) because when you created the form in the previous procedure, you left the `action` attribute of the `form` element blank:

```
<form method="post" action="">
```

When you submit the page this time, the values you entered are displayed just above the form:

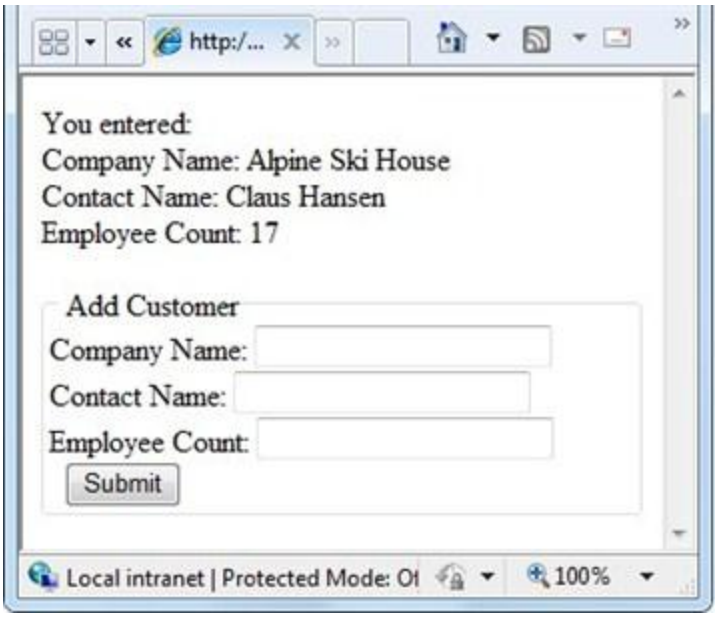


Look at the code for the page. You first use the `IsPost` method to determine whether the page is being posted — that is, whether a user clicked the **Submit** button. If this is a post, `IsPost` returns true. This is the standard way in ASP.NET Web Pages to determine whether you're working with an initial request (a GET request) or a postback (a POST request). (For more information about GET and POST, see the sidebar "HTTP GET and POST and the IsPost Property" in Chapter2 - Introduction to ASP.NET Web Programming Using the Razor Syntax.)

Next, you get the values that the user filled in from the `Request` object, and you put them in variables for later. The `Request` object contains all the values that were submitted with the page, each identified by a key. The key is the equivalent to the `name` attribute of the form field that you want to read. For example, to read the `companyname` field (text box), you use `Request["companyname"]`.

Form values are stored in the `Request` object as strings. Therefore, when you have to work with a value as a number or a date or some other type, you have to convert it from a string to that type. In the example, the `AsInt` method of the `Request` is used to convert the value of the employees field (which contains an employee count) to an integer.

2. Launch the page in your browser, fill in the form fields, and click **Submit**. The page displays the values you entered.



HTML Encoding for Appearance and Security

HTML has special uses for characters like <, >, and &. If these special characters appear where they're not expected, they can ruin the appearance and functionality of your web page. For example, the browser interprets the < character (unless it's followed by a space) as the beginning of an HTML element, like `<b>` or `<input ...>`. If the browser doesn't recognize the element, it simply discards the string that begins with < until it reaches something that it again recognizes. Obviously, this can result in some weird rendering in the page.

HTML encoding replaces these reserved characters with a code that browsers interpret as the correct symbol. For example, the < character is replaced with `&lt;` and the > character is replaced with `&gt;`. The browser renders these replacement strings as the characters that you want to see.

It's a good idea to use HTML encoding any time you display strings (input) that you got from a user. If you don't, a user can try to get your web page to run a malicious script or do something else that compromises your site security or that's just not what you intend. (This is particularly important if you take user input, store it someplace, and then display it later — for example, as a blog comment, user review, or something like that.)

To help prevent these problems, ASP.NET Web Pages automatically HTML-encodes any text content that you output from your code. For example, when you display the content of a variable or an expression using code such as `@MyVar`, ASP.NET Web Pages automatically encodes the output.

Validating User Input

Users make mistakes. You ask them to fill in a field, and they forget to, or you ask them to enter the number of employees and they type a name instead. To make sure that a form has been filled in correctly before you process it, you validate the user's input.

This procedure shows how to validate all three form fields to make sure the user didn't leave them blank. You also check that the employee count value is a number. If there are errors, you'll display an error message that tells the user what values didn't pass validation.

1. In the *Form.cshtml* file, replace the first block of code with the following code:

```
@{
    if (IsPost)  {
        var errors = false;
        var companyname = Request["companyname"];
        if (companyname.IsEmpty()) {
            errors = true;
            @:Company name is required.<br />
        }
        var contactname = Request["contactname"];
        if (contactname.IsEmpty()) {
            errors = true;
            @:Contact name is required.<br />
        }
        var employeecount = 0;
        if (Request["employees"].IsInt()) {
            employeecount = Request["employees"].AsInt();
        } else {
            errors = true;
            @:Employee count must be a number.<br />
        }
        if (errors == false) {
            <text>
              You entered: <br />
              Company Name: @companyname <br />
              Contact Name: @contactname <br />
              Employee Count: @employeecount <br />
            </text>
        }    }
}
```

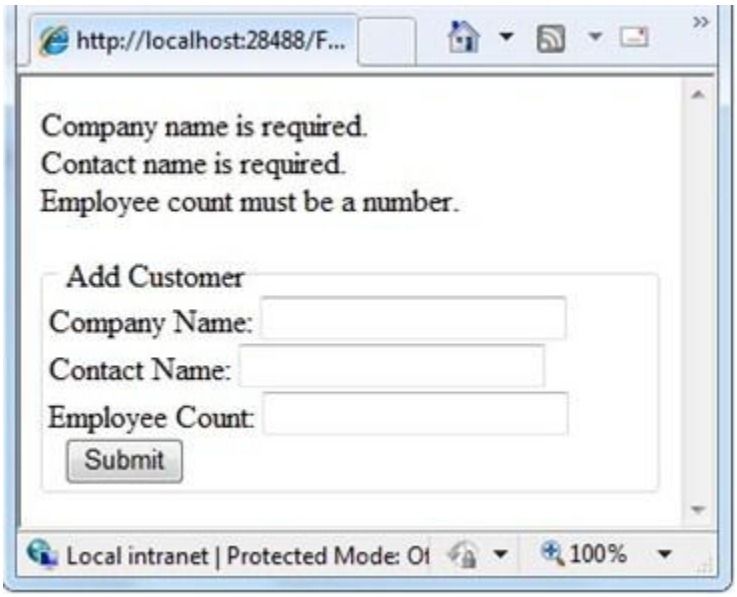
   This code is similar to the code you replaced, but there are a few differences. The first difference is that it initializes a variable named `errors` to false. You'll set this variable to true if any validation tests fail.

   Each time the code reads the value of a form field, it performs a validation test. For the `companyname` and `contactname` fields, you validate them by calling the `IsEmpty` function. If the test fails (that is, if `IsEmpty` returns true) the code sets the errors variable to true and the appropriate error message is displayed.

The next step is to make sure that the user entered a numeric value (an integer) for the employee count. To do this, you call the `IsInt` function. This function returns true if the value you're testing can be converted from a string to an integer. (Or of course false if the value *can't* be converted.) Remember that all values in the `Request` object are strings. Although in this example it doesn't really matter, if you wanted to do math operations on the value, the value would have to be converted to a number.

If `IsInt` tells you that the value is an integer, you set the `employeecount` variable to that value. However, before you do that, you have to actually convert it to an integer, because when `employeecount` was initialized, it was typed using `int`. Notice the pattern: the `IsInt` function tells you *whether* it's an integer; the `AsInt` function in the next line actually performs the conversion. If `IsInt` doesn't return true, the statements in the `else` block set the `errors` variable to true.

Finally, after all the testing is done, the code determines whether the `errors` variable is still false. If it is, the code displays the text block that contains the values the user entered. Launch the page in your browser, leave the form fields blank, and click **Submit**. Errors are displayed.



2. Enter values into the form fields and then click **Submit**. A page that shows the submitted values like you saw earlier is displayed.

Restoring Form Values After Postbacks

When you tested the page in the previous section, you might have noticed that if you had a validation error, everything you entered (not just the invalid data) was gone, and you had to re-enter values for all the fields. This illustrates an important point: when you submit a page, process it, and then render the page again, the page is re-created from scratch. As you saw, this means that any values that were in the page when it was submitted are lost.

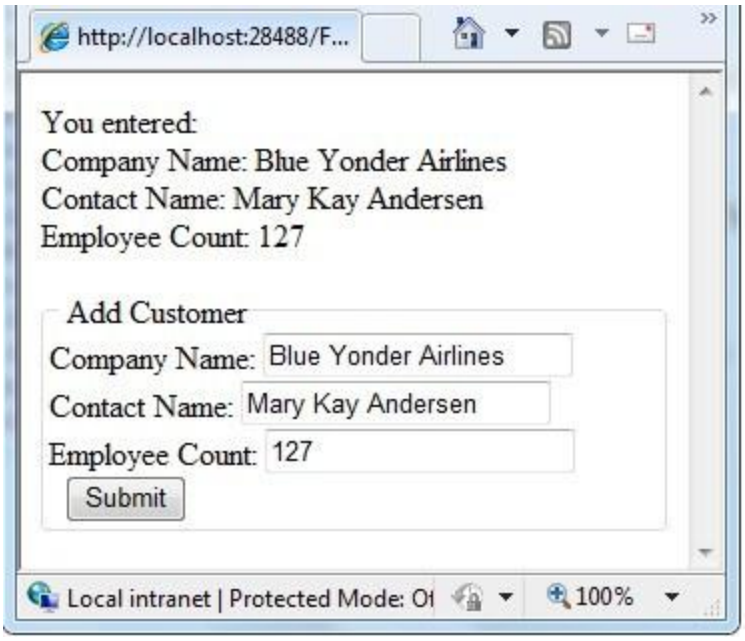
You can fix this easily, however. You have access to the values that were submitted (in the `Request` object, so you can fill those values back into the form fields when the page is rendered.

1. In the *Form.cshtml* file, replace the default page with the following markup:

```
<!DOCTYPE html>
<html>
    <head>
        <title>Customer Form</title>
    </head>
    <body>
      <form method="post" action="">
        <fieldset>
          <legend>Add Customer</legend>
          <div>
            <label for="CompanyName">Company Name:</label>
            <input type="text" name="CompanyName"
                   value="@Request["companyname"]" />
          </div>
          <div>
            <label for="ContactName">Contact Name:</label>
            <input type="text" name="ContactName"
                   value="@Request["contactname"]" />
          </div>
          <div>
            <label for="Employees">Employee Count:</label>
            <input type="text" name="Employees" value="@Request["employees"]" />
          </div>
          <div>
            <label> </label>
            <input type="submit" value="Submit" class="submit" />
          </div>
        </fieldset>
      </form>
    </body>
</html>
```

   The `value` attribute of the `<input>` elements has been set to dynamically read the field value out of the `Request` object. The first time that the page is requested, the values in the `Request` object are all empty. This is fine, because that way the form is blank.

2. Launch the page in your browser, fill in the form fields or leave them blank, and click **Submit**. A page that shows the submitted values is displayed.



Additional Resources

- 1,001 Ways to Get Input from Web Users
- Using Forms and Processing User Input
- Using AutoComplete in HTML Forms
- Gathering Information With HTML Forms
- Go Beyond HTML Forms With AJAX

Chapter 5 – Working with Data

This chapter describes how to access data from a database and display it using ASP.NET Web Pages.

What you'll learn

- How to create a database.
- How to connect to a database.
- How to display data in a web page.
- How to insert, update, and delete database records.

These are the features introduced in the chapter:

- Working with a Microsoft SQL Server Compact Edition database.
- Working with SQL queries.
- The `Database` class.

Introduction to Databases

Imagine a typical address book. For each entry in the address book (that is, for each person) you have several pieces of information such as first name, last name, address, email address, and phone number.

A typical way to picture data like this is as a table with rows and columns. In database terms, each row is often referred to as a record. Each column (sometimes referred to as fields) contains a value for each type of data: first name, last name, and so on.

ID	FirstName	LastName	Address	Email	Phone
1	Jim	Abrus	210 100th St SE Orcas WA 98031	jim@contoso.com	555 0100
2	Terry	Adams	1234 Main St. Seattle WA 99011	terry@cohowinery.com	555 0101

For most database tables, the table has to have a column that contains a unique identifier, like a customer number, account number, etc. This is known as the table's *primary key*, and you use it to identify each row in the table. In the example, the ID column is the primary key for the address book.

With this basic understanding of databases, you're ready to learn how to create a simple database and perform operations such as adding, modifying, and deleting data.

Relational Databases

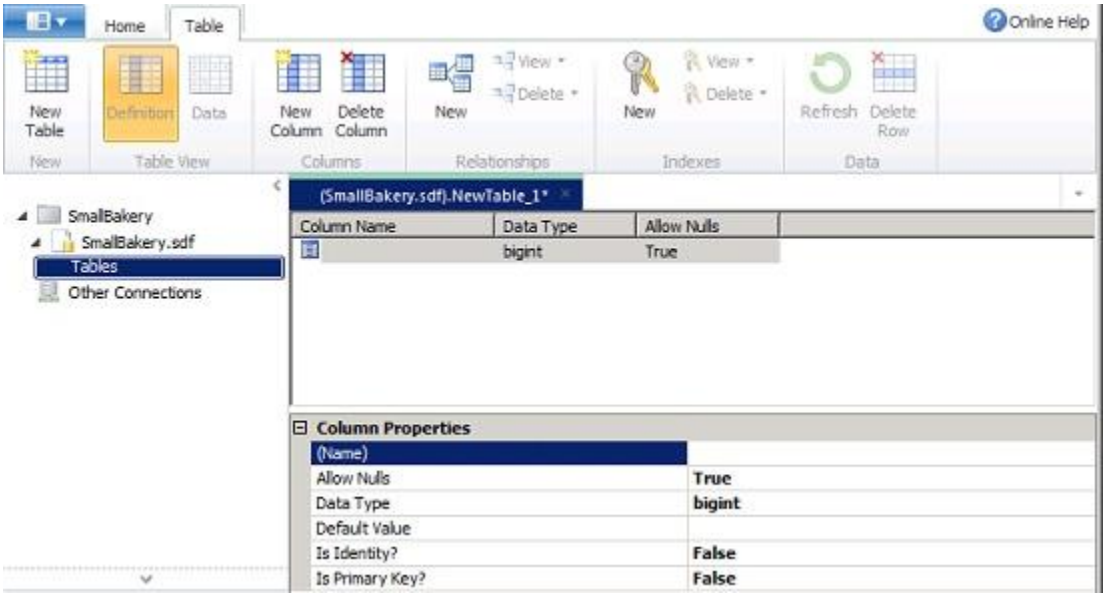
You can store data in lots of ways, including text files and spreadsheets. For most business uses, though, data is stored in a relational database.

This chapter doesn't go very deeply into databases. However, you might find it useful to understand a little about them. In a relational database, information is logically divided into separate tables. For example, a database for a school might contain separate tables for students and for class offerings. The database software (such as SQL Server) supports powerful commands that let you dynamically establish relationships between the tables. For example, you can use the relational database to establish a logical relationship between students and classes in order to create a schedule. Storing data in separate tables reduces the complexity of the table structure and reduces the need to keep redundant data in tables.

Creating a Database

This procedure shows you how to create a database named SmallBakery by using the SQL Server Compact Database design tool that's included in WebMatrix. Although you can create a database using code, it's more typical to create the database and database tables using a design tool like WebMatrix.

1. Start WebMatrix, and on the Quick Start page, click **Site From Template**.
2. Select **Empty Site**, and in the **Site Name** box enter "SmallBakery" and then click **OK**. The site is created and displayed in WebMatrix.
3. In the left pane, click the **Databases** workspace.
4. In the ribbon, click **New Database**. An empty database is created with the same name as your site.
5. In the left pane, expand the **SmallBakery.sdf** node and then double-click **Tables**.
6. In the ribbon, click **New Table**. WebMatrix opens the table designer.

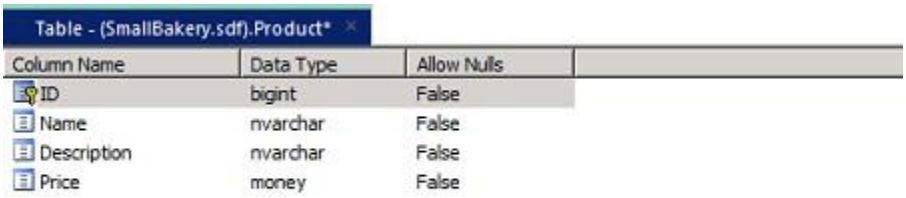


7. Under **Column Properties**, for **(Name)**, enter "Id".
8. For the new Id column, set **Is Identity** and **Is Primary Key** to true.

As the name suggests, **Is Primary Key** tells the database that this will be the table's primary key. **Is Identity** tells the database to automatically create an ID number for every new record and to assign it the next sequential number (starting at 1).

9. In the ribbon, click **New Column**.
10. Under **Column Properties**, for **(Name)**, enter "Name".
11. Set **Allow Nulls** to false. This will enforce that the *Name* column is not left blank.
12. Set **Data Type** to "nvarchar". The *var* part of `nvarchar` tells the database that the data for this column will be a string whose size might vary from record to record. (The *n* prefix represents *national*, indicating that the field can hold character data that represents any alphabet or writing system — that is, that the field holds Unicode data.)
13. Using this same process, create a column named *Description*. Set **Allow Nulls** to false and set **Data Type** to "nvarchar".
14. Create a column named *Price*. Set **Allow Nulls** to false and set **Data Type** to "money".
15. Press CTRL+S to save the table and name the table "Product".

When you're done, the definition will look like this:



Note When you edit the definition of a column in a table, you cannot use the Tab key to move from a property name to its value. Instead, select the property to edit and then start typing to change the property value if it's a text field, or press F4 to change the property value if it's in a drop-down field.

Adding Data to the Database

Now you can add some sample data to your database that you'll work with later in the chapter.

1. In the left pane, expand the **SmallBakery.sdf** node and then click **Tables**.
2. Right-click the Product table and then click **Data**.
3. In the edit pane, enter the following records:

Name	Description	Price
Bread	Baked fresh every day.	2.99
Strawberry Shortcake	Made with organic strawberries from our garden.	9.99
Apple Pie	Second only to your mom's pie.	12.99

Pecan Pie	If you like pecans, this is for you.	10.99
Lemon Pie	Made with the best lemons in the world.	11.99
Cupcakes	Your kids and the kid in you will love these.	7.99

4. Remember that you don't have to enter anything for the *Id* column. When you created the *Id* column, you set its **Is Identity** property to true, which causes it to automatically be filled in.
5. When you're finished entering the data, the table designer will look like this:

6.
7. Close the tab that contains the database data.

Displaying Data from a Database

Once you've got a database with data in it, you can display the data in an ASP.NET web page. To select the table rows to display, you use a SQL statement, which is a command that you pass to the database.

1. In the left pane, click the **Files** workspace.
2. In the root of the website, create a new CSHTML page named *ListProducts.cshtml*.
3. Replace the existing markup with the following:

```
@{
    var db = Database.Open("SmallBakery");
    var selectQueryString = "SELECT * FROM Product ORDER BY Name";
 }
<!DOCTYPE html>
<html>
 <head>
   <title>Small Bakery Products</title>
   <style>
       table, th, td {
         border: solid 1px #bbbbbb;
         border-collapse: collapse;
         padding: 2px;
       }
    </style>
 </head>
 <body>
   <h1>Small Bakery Products</h1>
   <table>
       <thead>
           <tr>
               <th>Id</th>
```

```
                <th>Product</th>
                <th>Description</th>
        <th>Price</th>
            </tr>
        </thead>
        <tbody>
            @foreach(var row in db.Query(selectQueryString)){
             <tr>
                <td>@row.Id</td>
                    <td>@row.Name</td>
                    <td>@row.Description</td>
                    <td>@row.Price</td>
             </tr>
            }
        </tbody>
   </table>
 </body>
</html>
```

In the first code block, you open the *SmallBakery.sdf* file (database) that you created earlier. The `Database.Open` method assumes that the *.sdf* file is in your website's *App_Data* folder. (Notice that you don't need to specify the *.sdf* extension — in fact, if you do, the `Open` method won't work.)

Note The *App_Data* folder is a special folder in ASP.NET that's used to store data files. For more information, see Connecting to a Database later in this chapter.

You then make a request to query the database using the following SQL `Select` statement:

```
SELECT * FROM Product ORDER BY Name
```

In the statement, `Product` identifies the table to query. The `*` character specifies that the query should return all the columns from the table. (You could also list columns individually, separated by commas, if you wanted to see only some of the columns.) The `Order By` clause indicates how the data should be sorted — in this case, by the *Name* column. This means that the data is sorted alphabetically based on the value of the *Name* column for each row.

In the body of the page, the markup creates an HTML table that will be used to display the data. Inside the `<tbody>` element, you use a `foreach` loop to individually get each data row that's returned by the query. For each data row, you create an HTML table row (`<tr>` element). Then you create HTML table cells (`<td>` elements) for each column. Each time you go through the loop, the next available row from the database is in the `row` variable (you set this up in the `foreach` statement). To get an individual column from the row, you can use `row.Name` or `row.Description` or whatever the name is of the column you want.

4. Run the page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.) The page displays a list like the following:

Id	Product	Description	Price
3	Apple Pie	Second only to your mom's pie.	12.99
1	Bread	Baked fresh every day	2.99
6	Cupcakes	Your kids and the kid in you will love these.	7.99
5	Lemon Pie	Made with the best lemons in the world.	11.99
4	Pecan Pie	If you like pecans, this is for you.	10.99
2	Strawberry Shortcake	Made with organic strawberries from our garden.	9.99

Structured Query Language (SQL)

SQL is a language that's used in most relational databases for managing data in a database. It includes commands that let you retrieve data and update it, and that let you create, modify, and manage database tables. SQL is different than a programming language (like the one you're using in WebMatrix) because with SQL, the idea is that you tell the database what you want, and it's the database's job to figure out how to get the data or perform the task. Here are examples of some SQL commands and what they do:

```
SELECT Id, Name, Price FROM Product WHERE Price > 10.00 ORDER BY Name
```

This fetches the *Id*, *Name*, and *Price* columns from records in the *Product* table if the value of *Price* is more than 10, and returns the results in alphabetical order based on the values of the *Name* column. This command will return a result set that contains the records that meet the criteria, or an empty set if no records match.

```
INSERT INTO Product (Name, Description, Price) VALUES ("Croissant", "A flaky delight", 1.99)
```

This inserts a new record into the *Product* table, setting the *Name* column to "Croissant", the *Description* column to "A flaky delight", and the price to 1.99.

```
DELETE FROM Product WHERE ExpirationDate < "01/01/2008"
```

This command deletes records in the *Product* table whose expiration date column is earlier than January 1, 2008. (This assumes that the *Product* table has such a column, of course.) The date is entered here in MM/DD/YYYY format, but it should be entered in the format that's used for your locale.

The `Insert Into` and `Delete` commands don't return result sets. Instead, they return a number that tells you how many records were affected by the command.

For some of these operations (like inserting and deleting records), the process that's requesting the operation has to have appropriate permissions in the database. This is why for production databases you often have to supply a username and password when you connect to the database.

There are dozens of SQL commands, but they all follow a pattern like this. You can use SQL commands to create database tables, count the number of records in a table, calculate prices, and perform many more operations.

Inserting Data in a Database

This section shows how to create a page that lets users add a new product to the *Product* database table. After a new product record is inserted, the page displays the updated table using the *ListProducts.cshtml* page that you created in the previous section.

The page includes validation to make sure that the data that the user enters is valid for the database. For example, code in the page makes sure that a value has been entered for all required columns.

Note For some of these operations (like inserting and deleting records), the process that's requesting the operation has to have appropriate permissions in the database. For production databases (as opposed to the test database that you're working with in WebMatrix) you often have to supply a username and password when you connect to the database.

1. In the website, create a new CSHTML file named *InsertProducts.cshtml*.
2. Replace the existing markup with the following:

```
@{
    var db = Database.Open("SmallBakery");
    var Name = Request["Name"];
    var Description = Request["Description"];
    var Price = Request["Price"];

    if (IsPost) {

        // Read product name.
        Name = Request["Name"];
        if (Name.IsEmpty()) {
           ModelState.AddError("Name", "Product name is required.");
        }

        // Read product description.
        Description = Request["Description"];
        if (Description.IsEmpty()) {
          ModelState.AddError("Description",
                "Product description is required.");
         }

        // Read product price
        Price = Request["Price"];
        if (Price.IsEmpty()) {
          ModelState.AddError("Price", "Product price is required.");
        }

        // Define the insert query. The values to assign to the
        // columns in the Product table are defined as parameters
```

```
        // with the VALUES keyword.
        if(ModelState.IsValid) {
            var insertQuery = "INSERT INTO Product (Name, Description, Price) " +
                "VALUES (@0, @1, @2)";
            db.Execute(insertQuery, Name, Description, Price);
            // Display the page that lists products.
            Response.Redirect(@Href("~/ListProducts"));
        }
    }
}

<!DOCTYPE html>
<html>
<head>
   <title>Add Products</title>
   <style type="text/css">
      label {float:left; width: 8em; text-align: right;
               margin-right: 0.5em;}
      fieldset {padding: 1em; border: 1px solid; width: 35em;}
      legend {padding: 2px 4px; border: 1px solid; font-weight:bold;}
      .validation-summary-errors {font-weight:bold; color:red; font-size: 11pt;}
   </style>
</head>
<body>
   <h1>Add New Product</h1>

   @Html.ValidationSummary("Errors with your submission:")

   <form method="post" action="">
       <fieldset>
           <legend>Add Product</legend>
           <div>
               <label>Name:</label>
               <input name="Name" type="text" size="50" value="@Name" />
           </div>
           <div>
               <label>Description:</label>
               <input name="Description" type="text" size="50"
                   value="@Description" />
           </div>
           <div>
               <label>Price:</label>
               <input name="Price" type="text" size="50" value="@Price" />
           </div>
           <div>
               <label> </label>
               <input type="submit" value="Insert" class="submit" />
           </div>
       </fieldset>

   </form>
</body>
</html>
```

The body of the page contains an HTML form with three text boxes that let users enter a name, description, and price. When users click the **Insert** button, the code at the top of the page opens

a connection to the *SmallBakery.sdf* database. You then get the values that the user has submitted by using the `Request` object and assign those values to local variables.

To validate that the user entered a value for each required column, you do this:

```
Name = Request["Name"];
if (Name.IsEmpty()) {
    ModelState.AddError("Name",
        "Product name is required.");
}
```

If the value of the *Name* column is empty, you use the `ModelState.AddError` method and pass it an error message. You repeat this for each column you want to check. After all the columns have been checked, you perform this test:

```
if(ModelState.IsValid) { // ...  }
```

If all the columns validated (none were empty), you go ahead and create a SQL statement to insert the data and then execute it as shown next:

```
var insertQuery =
    "INSERT INTO Product (Name, Description, Price) VALUES (@0, @1, @2)";
```

For the values to insert, you include parameter placeholders (`@0`, `@1`, `@2`).

Note As a security precaution, always pass values to a SQL statement using parameters, as you see in the preceding example. This gives you a chance to validate the user's data, plus it helps protect against attempts to send malicious commands to your database (sometimes referred to as SQL injection attacks).

To execute the query, you use this statement, passing to it the variables that contain the values to substitute for the placeholders:

```
db.Execute(insertQuery, Name, Description, Price);
```

After the `Insert Into` statement has executed, you send the user to the page that lists the products using this line:

```
Response.Redirect("~/ListProducts");
```

If validation didn't succeed, you skip the insert. Instead, you have a helper in the page that can display the accumulated error messages (if any):

```
@Html.ValidationSummary("Errors with your submission:")
```

Notice that the style block in the markup includes a CSS class definition named `.validation-summary-errors`. This is the name of the CSS class that's used by default for the `<div>` element

that contains any validation errors. In this case, the CSS class specifies that validation summary errors are displayed in red and in bold, but you can define the `.validation-summary-errors` class to display any formatting you like.

3. View the page in a browser. The page displays a form that's similar to the one that's shown in the following illustration.

4. Enter values for all the columns, but make sure that you leave the *Price* column blank.
5. Click **Insert**. The page displays an error message, as shown in the following illustration. (No new record is created.)

6. Fill the form out completely, and then click **Insert**. This time, the *ListProducts.cshtml* page is displayed and shows the new record.

Updating Data in a Database

After data has been entered into a table, you might need to update it. This procedure shows you how to create two pages that are similar to the ones you created for data insertion earlier. The first page displays products and lets users select one to change. The second page lets the users actually make the edits and save them.

Important In a production website, you typically restrict who's allowed to make changes to the data. For information about how to set up membership and about ways to authorize users to perform tasks on the site, see Chapter 16 - Adding Security and Membership.

1. In the website, create a new CSHTML file named *EditProducts.cshtml*.
2. Replace the existing markup in the file with the following:

```
@{
    var db = Database.Open("SmallBakery");
    var selectQueryString = "SELECT * FROM Product ORDER BY Name";
```

```
}
<!DOCTYPE html>
<html>
<head>
    <title>Edit Products</title>
    <style type="text/css">
        table, th, td {
          border: solid 1px #bbbbbb;
          border-collapse: collapse;
          padding: 2px;
        }
    </style>
</head>
<body>
    <h1>Edit Small Bakery Products</h1>
    <table>
      <thead>
        <tr>
          <th> </th>
          <th>Name</th>
          <th>Description</th>
          <th>Price</th>
        </tr>
      </thead>
      <tbody>
        @foreach (var row in db.Query(selectQueryString)) {
          <tr>
            <td><a href="@Href("~/UpdateProducts", row.Id)">Edit</a></td>
            <td>@row.Name</td>
            <td>@row.Description</td>
            <td>@row.Price</td>
          </tr>
        }
      </tbody>
    </table>
</body>
</html>
```

The only difference between this page and the *ListProducts.cshtml* page from earlier is that the HTML table in this page includes an extra column that displays an **Edit** link. When you click this link, it takes you to the *UpdateProducts.cshtml* page (which you'll create next) where you can edit the selected record.

Look at the code that creates the **Edit** link:

```
<a href="@Href("~/UpdateProducts", row.Id)">Edit</a></td>
```

This creates an HTML anchor (an `<a>` element) whose `href` attribute is set dynamically. The `href` attribute specifies the page to display when the user clicks the link. It also passes the `Id` value of the current row to the link. When the page runs, the page source might contain links like these:

```
<a href="UpdateProducts/1">Edit</a></td>
<a href="UpdateProducts/2">Edit</a></td>
<a href="UpdateProducts/3">Edit</a></td>
```

Notice that the `href` attribute is set to `UpdateProducts/n`, where *n* is a product number. When a user clicks one of these links, the resulting URL will look something like this:

http://localhost:18816/UpdateProducts/6

In other words, the product number to be edited will be passed in the URL.

3. View the page in a browser. The page displays the data in a format like this:

	Name	Description	Price
Edit	Apple Pie	Second only to your mom's pie.	12.99
Edit	Bread	Baked fresh every day.	2.99
Edit	Cherry Pie	Made with organic cherries from our garden.	8.99
Edit	Cupcakes	Your kids and the kid in you will love these.	7.99
Edit	Lemon Pie	Made with the best lemmons in the world.	11.99
Edit	Pecan Pie	If you like pecans this is fro you.	10.99
Edit	Strawberry Shortcake	Made with organic strawberries from our garden.	9.99

Next, you'll create the page that lets users actually update the data. The update page includes validation to validate the data that the user enters. For example, code in the page makes sure that a value has been entered for all required columns.

4. In the website, create a new CSHTML file named *UpdateProducts.cshtml*.
5. Replace the existing markup in the file with the following:

```
@{
    var db = Database.Open("SmallBakery");
    var selectQueryString = "SELECT * FROM Product WHERE Id=@0";

    var ProductId  = UrlData[0];

    if (ProductId.IsEmpty()) {
         Response.Redirect(@Href("~/EditProducts"));
     }

    var row = db.QuerySingle(selectQueryString, ProductId);

    var Name = row.Name;
    var Description = row.Description;
    var Price = row.Price;

    if (IsPost) {
         Name = Request["Name"];
         if (String.IsNullOrEmpty(Name)) {
           ModelState.AddError("Name", "Product name is required.");
         }

        Description = Request["Description"];
        if (String.IsNullOrEmpty(Description)) {
          ModelState.AddError("Description",
```

```
                "Product description is required.");
        }

        Price = Request["Price"];
        if (String.IsNullOrEmpty(Price)) {
          ModelState.AddError("Price", "Product price is required.");
        }

        if(ModelState.IsValid) {
            var updateQueryString =
              "UPDATE Product SET Name=@0, Description=@1, Price=@2 WHERE Id=@3" ;
            db.Execute(updateQueryString, Name, Description, Price, ProductId);
            Response.Redirect(@Href("~/EditProducts"));
        }
    }
}

<!DOCTYPE html>
<html>
<head>
    <title>Add Products</title>
    <style type="text/css">
       label { float: left; width: 8em; text-align: right;
               margin-right: 0.5em;}
       fieldset { padding: 1em; border: 1px solid; width: 35em;}
       legend { padding: 2px 4px;  border: 1px solid; font-weight: bold;}
       .validation-summary-errors {font-weight:bold; color:red; font-size:11pt;}
    </style>
</head>
<body>
    <h1>Update Product</h1>

    @Html.ValidationSummary("Errors with your submission:")

    <form method="post" action="">
        <fieldset>
            <legend>Update Product</legend>
            <div>
                <label>Name:</label>
                <input name="Name" type="text" size="50" value="@Name" />
            </div>
            <div>
                <label>Description:</label>
                <input name="Description" type="text" size="50"
                   value="@Description" />
            </div>
            <div>
                <label>Price:</label>
                <input name="Price" type="text" size="50" value="@Price" />
            </div>
            <div>
                <label> </label>
                <input type="submit" value="Update" class="submit" />
            </div>
        </fieldset>
    </form>
</body>
</html>
```

The body of the page contains an HTML form where a product is displayed and where users can edit it. To get the product to display, you use this SQL statement:

```
SELECT * FROM Product WHERE Id=@0
```

This will select the product whose ID matches the value that's passed in the `@0` parameter. (Because *Id* is the primary key and therefore must be unique, only one product record can ever be selected this way.) To get the ID value to pass to this `Select` statement, you can read the value that's passed to the page as part of the URL, using the following syntax:

```
var ProductId  = UrlData[0];
```

To actually fetch the product record, you use the `QuerySingle` method, which will return just one record:

```
var row = db.QuerySingle(selectQueryString, ProductId);
```

The single row is returned into the `row` variable. You can get data out of each column and assign it to local variables like this:

```
var Name = row.Name;
var Description = row.Description;
var Price = row.Price;
```

In the markup for the form, these values are displayed automatically in individual text boxes by using embedded code like the following:

```
<input name="Name" type="text" size="50" value="@Name" />
```

That part of the code displays the product record to be updated. Once the record has been displayed, the user can edit individual columns.

When the user submits the form by clicking the **Update** button, the code in the `if(IsPost)` block runs. This gets the user's values from the `Request` object, stores the values in variables, and validates that each column has been filled in. If validation passes, the code creates the following SQL Update statement:

```
UPDATE Product SET Name=@0, Description=@1, Price=@2, WHERE ID=@3
```

In a SQL `Update` statement, you specify each column to update and the value to set it to. In this code, the values are specified using the parameter placeholders `@0`, `@1`, `@2`, and so on. (As noted earlier, for security, you should always pass values to a SQL statement by using parameters.)

When you call the `db.Execute` method, you pass the variables that contain the values in the order that corresponds to the parameters in the SQL statement:

```
db.Execute(updateQueryString, Name, Description, Price, ProductId);
```

After the `Update` statement has been executed, you call the following method in order to redirect the user back to the edit page:

```
Response.Redirect(@Href("~/EditProducts"));
```

The effect is that the user sees an updated listing of the data in the database and can edit another product.

6. Save the page.
7. Run the *EditProducts.cshtml* page (not the update page) and then click **Edit** to select a product to edit. The *UpdateProducts.cshtml* page is displayed, showing the record you selected.

8. Make a change and click **Update**. The products list is shown again with your updated data.

Deleting Data in a Database

This section shows how to let users delete a product from the *Product* database table. The example consists of two pages. In the first page, users select a record to delete. The record to be deleted is then displayed in a second page that lets them confirm that they want to delete the record.

> **Important** In a production website, you typically restrict who's allowed to make changes to the data. For information about how to set up membership and about ways to authorize user to perform tasks on the site, see Chapter 16 - Adding Security and Membership.

1. In the website, create a new CSHTML file named *ListProductsForDelete.cshtml*.
2. Replace the existing markup with the following:

```
@{
  var db = Database.Open("SmallBakery");
  var selectQueryString = "SELECT * FROM Product ORDER BY Name";
}
<!DOCTYPE html>
<html>
<head>
    <title>Delete a Product</title>
    <style>
        table, th, td {
          border: solid 1px #bbbbbb;
          border-collapse: collapse;
          padding: 2px;
        }
     </style>
```

```
</head>
<body>
  <h1>Delete a Product</h1>
  <form method="post" action="" name="form">
    <table border="1">
      <thead>
        <tr>
          <th> </th>
          <th>Name</th>
          <th>Description</th>
          <th>Price</th>
        </tr>
      </thead>
      <tbody>
        @foreach (var row in db.Query(selectQueryString)) {
          <tr>
            <td><a href="@Href("~/DeleteProduct", row.Id)">Delete</a></td>
            <td>@row.Name</td>
            <td>@row.Description</td>
            <td>@row.Price</td>
          </tr>
        }
      </tbody>
    </table>
  </form>
</body>
</html>
```

This page is similar to the *EditProducts.cshtml* page from earlier. However, instead of displaying an **Edit** link for each product, it displays a **Delete** link. The **Delete** link is created using the following embedded code in the markup:

```
<a href="@Href("~/DeleteProduct", row.Id)">Delete</a>
```

This creates a URL that looks like this when users click the link:

http://<server>/DeleteProduct/4

The URL calls a page named *DeleteProduct.cshtml* (which you'll create next) and passes it the ID of the product to delete (here, 4).

3. Save the file, but leave it open.
4. Create another CHTML file named *DeleteProduct.cshtml* and replace the existing content with the following:

```
@{
  var db = Database.Open("SmallBakery");
  var ProductId = UrlData[0];
  if (ProductId.IsEmpty()) {
    Response.Redirect(@Href("~/ListProductsForDelete"));
  }
  var prod = db.QuerySingle("SELECT * FROM PRODUCT WHERE ID = @0", ProductId);
  if( IsPost && !ProductId.IsEmpty()) {
    var deleteQueryString = "DELETE FROM Product WHERE Id=@0";
```

```
    db.Execute(deleteQueryString, ProductId);
    Response.Redirect("~/ListProductsForDelete");
  }
}

<!DOCTYPE html>
<html
<head>
    <title>Delete Product</title>
</head>
<body>
  <h1>Delete Product - Confirmation</h1>
  <form method="post" action="" name="form">
    <p>Are you sure you want to delete the following product?</p>

    <p>Name: @prod.Name <br />
       Description: @prod.Description <br />
       Price: @prod.Price</p>
    <p><input type="submit" value="Delete" /></p>
  </form>
</body>
</html>
```

This page is called by *ListProductsForDelete.cshtml* and lets users confirm that they want to delete a product. To list the product to be deleted, you get the ID of the product to delete from the URL using the following code:

```
var ProductId = UrlData[0];
```

The page then asks the user to click a button to actually delete the record. This is an important security measure: when you perform sensitive operations in your website like updating or deleting data, these operations should always be done using a POST operation, not a GET operation. If your site is set up so that a delete operation can be performed using a GET operation, anyone can pass a URL like *http://<server>/DeleteProduct/4* and delete anything they want from your database. By adding the confirmation and coding the page so that the deletion can be performed only by using a POST, you add a measure of security to your site.

The actual delete operation is performed using the following code, which first confirms that this is a post operation and that the ID isn't empty:

```
if( IsPost && !ProductId.IsEmpty()) {
    var deleteQueryString = "DELETE FROM Product WHERE Id=@0";
    db.Execute(deleteQueryString, ProductId);
    Response.Redirect("~/ListProductsForDelete");
}
```

The code runs a SQL statement that deletes the specified record and then redirects the user back to the listing page.

5. Run *ListProductsForDelete.cshtml* in a browser.

	Name	Description	Price
Delete	Apple Pie	Second only to your mom's pie.	12.99
Delete	Bread	Baked fresh every day.	2.99
Delete	Cherry Pie	Made with organic cherries from our garden.	8.99
Delete	Cupcakes	Your kids and the kid in you will love these.	7.99
Delete	Lemon Pie	Made with the best lemmons in the world.	11.99
Delete	Pecan Pie	If you like pecans this is fro you.	10.99
Delete	Strawberry Shortcake	Made with organic strawberries from our garden.	9.99

6. Click the **Delete** link for one of the products. The *DeleteProduct.cshtml* page is displayed to confirm that you want to delete that record.
7. Click the **Delete** button. The product record is deleted and the page is refreshed with an updated product listing.

Connecting to a Database

You can connect to a database in two ways. The first is to use the `Database.Open` method and to specify the name of the database file (less the *.sdf* extension):

```
var db = Database.Open("SmallBakery");
```

The `Open` method assumes that the *.sdf* file is in the website's *App_Data* folder. This folder is designed specifically for holding data. For example, it has appropriate permissions to allow the website to read and write data, and as a security measure, WebMatrix does not allow access to files from this folder.

The second way is to use a connection string. A connection string contains information about how to connect to a database. This can include a file path, or it can include the name of a SQL Server database on a local or remote server, along with a user name and password to connect to that server. (If you keep data in a centrally managed version of SQL Server, such as on a hosting provider's site, you always use a connection string to specify the database connection information.)

In WebMatrix, connection strings are usually stored in an XML file named *Web.config*. As the name implies, you can use a *Web.config* file in the root of your website to store the site's configuration information, including any connection strings that your site might require. An example of a connection string in a *Web.config* file might look like the following:

```
<?xml version="1.0" encoding="utf-8" ?>
<configuration>
  <connectionStrings>
   <add
     name="SQLServerConnectionString"
     connectionString= "server=myServer;database=myDatabase;uid=username;pwd=password"
     providerName="System.Data.SqlClient" />
  </connectionStrings>
</configuration>
```

In the example, the connection string points to a database in an instance of SQL Server that's running on a server somewhere (as opposed to a local *.sdf* file). You would need to substitute the appropriate names for `myServer` and `myDatabase`, and specify SQL Server login values for `username` and `password`. (The username and password values are not necessarily the same as your Windows credentials or as the values that your hosting provider has given you for logging in to their servers. Check with the administrator for the exact values you need.)

The `Database.Open` method is flexible, because it lets you pass either the name of a database *.sdf* file or the name of a connection string that's stored in the *Web.config* file. The following example shows how to connect to the database using the connection string illustrated in the previous example:

```
@{
    var db = Database.Open("SQLServerConnectionString");
}
```

As noted, the `Database.Open` method lets you pass either a database name or a connection string, and it'll figure out which to use. This is very useful when you deploy (publish) your website. You can use an *.sdf* file in the *App_Data* folder when you're developing and testing your site. Then when you move your site to a production server, you can use a connection string in the *Web.config* file that has the same name as your *.sdf* file but that points to the hosting provider's database — all without having to change your code.

Finally, if you want to work directly with a connection string, you can call the `Database.OpenConnectionString` method and pass it the actual connection string instead of just the name of one in the *Web.config* file. This might be useful in situations where for some reason you don't have access to the connection string (or values in it, such as the *.sdf* file name) until the page is running. However, for most scenarios, you can use `Database.Open` as described in this chapter.

Additional Resources

- SQL Server Compact
- Connecting to a SQL Server or MySQL Database in WebMatrix

Chapter 6 – Displaying Data in a Grid

This chapter explains how to use a helper to display data in an HTML table (in a grid).

What you'll learn

- How to display data in a web page using the `WebGrid` helper.
- How to format the data that's displayed in the grid.
- How to add paging to the grid.

These are the ASP.NET programming features introduced in the chapter:

- The `WebGrid` helper.

The WebGrid Helper

In the previous chapter, you displayed data in a page by doing all the work yourself. But there's also an easier way to display data — use the `WebGrid` helper. The helper can render an HTML table for you that displays data. The helper supports options for formatting, for creating a way to page through the data, and for letting users sort just by clicking a column heading.

Displaying Data Using the WebGrid Helper

This procedure shows you how to display data in a `WebGrid` helper by using its simplest configuration.

1. Open the website you created for Chapter 5 - Working with Data.

   If you didn't run the procedures in that chapter, you don't need to run all of them now. However, you do need the *SmallBakery.sdf* database file that's created at the beginning of Chapter 5. This file must be in the *App_Data* folder of the website you're working with.

2. In your website, create a new CSHTML file named *WebGridBasic.cshtml*.
3. Replace the existing markup with the following:

```
@{
    var db = Database.Open("SmallBakery") ;
    var selectQueryString = "SELECT * FROM Product ORDER BY Id";
    var data = db.Query(selectQueryString);
    var grid = new WebGrid(data);
}
<!DOCTYPE html>
<html>
    <head>
        <title>Displaying Data Using the WebGrid Helper</title>
    </head>
    <body>
```

```
        <h1>Small Bakery Products</h1>
        <div id="grid">
            @grid.GetHtml()
        </div>
    </body>
</html>
```

The code first opens the *SmallBakery.sdf* database file and creates a SQL `Select` statement:

```
SELECT * FROM Product ORDER BY Id
```

A variable named `data` is populated with the returned data from the SQL `Select` statement. The `WebGrid` helper is then used to create a new grid from data:

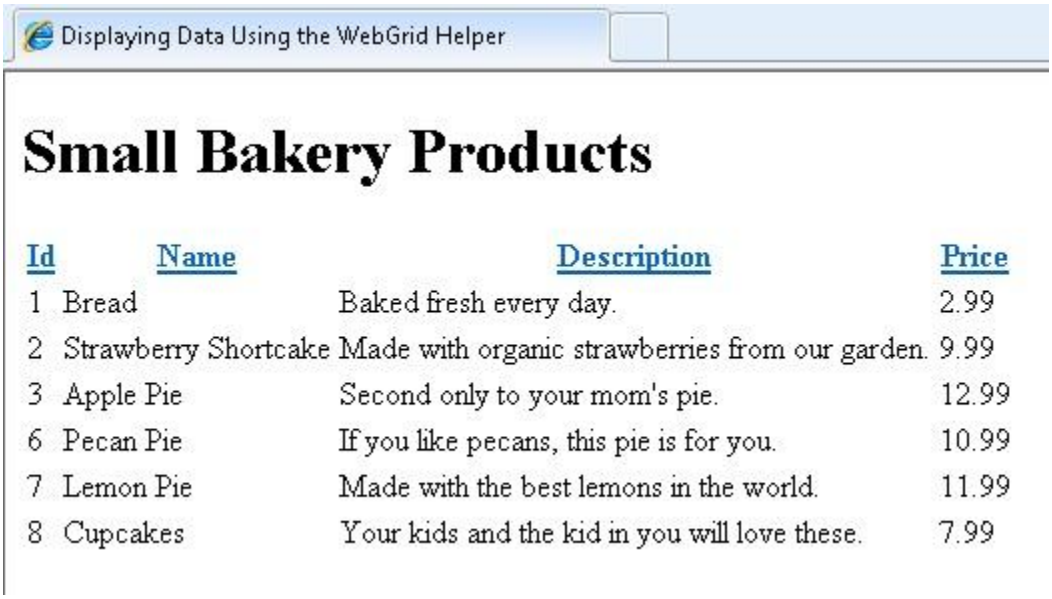
```
var data = db.Query(selectQueryString);
var grid = new WebGrid(data);
```

This code creates a new `WebGrid` object and assigns it to the `grid` variable. In the body of the page, you render the data using the `WebGrid` helper by using this code:

```
@grid.GetHtml()
```

The `grid` variable is the value you created when you created the `WebGrid` object.

4. Run the page. (Make sure the page is selected in the **Files** workspace before you run it.) The `WebGrid` helper renders an HTML table that contains the data selected based on the SQL `Select` statement:



Notice that you can click column names to sort the table by the data in those columns.

As you can see, even using the simplest possible code for the `WebGrid` helper does a lot of work for you when displaying (and sorting) the data. The helper can do quite a bit more as well. In the remainder of this chapter, you'll see how you can configure the `WebGrid` helper to do the following:

- Specify which data columns to display and how to format the display of those columns.
- Style the grid as a whole.
- Page through data.

Specifying and Formatting Columns to Display

By default, the `WebGrid` helper displays all the data columns that are returned by the SQL query. You can customize the display of this data in the following ways:

- Specify which columns the helper displays, and in what order. You might do this if you want to display only a subset of the data columns that are returned by the SQL query.
- Specify formatting instructions for how data should be displayed — for example, add a currency symbol (like "$") to data that represents money.

In this procedure, you'll use `WebGrid` helper options to format individual columns.

1. In the website, create a new page named *WebGridColumnFormat.cshtml*.
2. Replace the existing markup with the following:

```
@{
    var db = Database.Open("SmallBakery") ;
    var selectQueryString = "SELECT * FROM Product ORDER BY Id";
    var data = db.Query(selectQueryString);
    var grid = new WebGrid(data);
}
<!DOCTYPE html>
<html>
    <head>
        <title>Displaying Data Using the WebGrid Helper (Custom Formatting)</title>
        <style type="text/css">
            .product { width: 200px; font-weight:bold;}
        </style>
    </head>
    <body>
        <h1>Small Bakery Products</h1>
        <div id="grid">
            @grid.GetHtml(
                columns: grid.Columns(
                    grid.Column("Name", "Product", style: "product"),
                    grid.Column("Description", format:@<i>@item.Description</i>),
                    grid.Column("Price", format:@<text>$@item.Price</text>)
                )
            )
        </div>
    </body>
</html>
```

This example is like the previous one, except that when you render the grid in the body of the page by calling `grid.GetHtml`, you're specifying both the columns to display and how to display them. The following code shows how to specify which columns to display and the order in which they should be displayed:

```
@grid.GetHtml(
    columns: grid.Columns(
        grid.Column("Name", "Product", style: "product"),
        grid.Column("Description", format:@<i>@item.Description</i>),
        grid.Column("Price", format:@<text>$@item.Price</text>)
)
```

To tell the helper which columns to display, you must include a `columns` parameter for the `GetHtml` method of the `WebGrid` helper, and pass in a collection of columns. In this collection, you can specify each column to include. You specify an individual column to display by including a `grid.Column` object, and pass in the name of the data column you want. In this example, the code causes the `WebGrid` object to display only three columns: *Name*, *Description*, and *Price*. (These columns must be included in the SQL query results — the helper cannot display columns that were not returned by the query.)

However, notice that in addition to just passing a column name to the `grid`, you can pass other formatting instructions. In the example, the code displays the *Name* column using the following code:

```
grid.Column("Name", "Product", style: "product")
```

This tells the `WebGrid` helper to do the following:

- Display values from the *Name* data column.
- Use the string "Product" as the column heading instead of the default name for the heading (which in this case would be "Name").
- Apply the CSS style class named "product". In the example page markup, this CSS class sets a column width (200 pixels) and a font weight (bold).

The example for the *Description* column uses the following code:

```
grid.Column("Description", format:@<i>@item.Description</i>)
```

This tells the helper to display the *Description* column. It specifies a format by using an expression that wraps the value from the data column in some HTML markup:

```
@<i>@item.Description</i>
```

The example for the *Price* column shows another variation of how to specify the `format` property:

```
grid.Column("Price", format:@<text>$@item.Price</text>)
```

This again specifies some HTML markup to render, and adds a dollar sign ($) before the column value.

3. View the page in a browser.

You see only three columns this time. The *Name* column customizes the column heading, size, and font weight. The *Description* column is in italics, and the *Price* column now includes a dollar sign.

Styling the Grid as a Whole

In addition to specifying how individual columns should be displayed, you can format the whole grid. To do so, you define CSS classes that specify how the rendered HTML table will look.

1. In the website, create a new page named *WebGridTableFormat.cshtml*.
2. Replace the existing markup with the following:

```
@{
    var db = Database.Open("SmallBakery");
    var selectQueryString = "SELECT * FROM Product ORDER BY Id";
    var data = db.Query(selectQueryString);
    var grid = new WebGrid(source: data, defaultSort: "Name");
}
<!DOCTYPE html>
<html>
    <head>
        <title>Displaying Data Using the WebGrid Helper (Custom Table
Formatting)</title>
        <style type="text/css">
            .grid { margin: 4px; border-collapse: collapse; width: 600px; }
            .head { background-color: #E8E8E8; font-weight: bold; color: #FFF; }
```

```
            .grid th, .grid td { border: 1px solid #C0C0C0; padding: 5px; }
            .alt { background-color: #E8E8E8; color: #000; }
            .product { width: 200px; font-weight:bold;}
        </style>
    </head>
    <body>
        <h1>Small Bakery Products</h1>
        <div id="grid">
            @grid.GetHtml(
                tableStyle: "grid",
                headerStyle: "head",
                alternatingRowStyle: "alt",
                columns: grid.Columns(
                    grid.Column("Name", "Product", style: "product"),
                    grid.Column("Description", format:@<i>@item.Description</i>),
                    grid.Column("Price", format:@<text>$@item.Price</text>)
                )
            )
        </div>
    </body>
</html>
```

This code builds on the previous example by showing you how to create new style classes (`grid`, `head`, `grid th`, `grid td`, and `alt`). The `grid.GetHtml` method then assigns these styles to various elements of the grid using the `tableStyle`, `headerStyle`, and `alternatingRowStyle` parameters.

3. View the page in a browser. This time, the grid is displayed using different styles that apply to the table as a whole, such a banding for alternating rows.

Small Bakery Products

Product	Description	Price
Apple Pie	*Second only to your mom's pie.*	$12.99
Bread	*Baked fresh every day.*	$2.99
Cupcakes	*Your kids and the kid in you will love these.*	$7.99
Lemon Pie	*Made with the best lemons in the world.*	$11.99
Pecan Pie	*If you like pecans, this pie is for you.*	$10.99
Strawberry Shortcake	*Made with organic strawberries from our garden.*	$9.99

Paging Through Data

Rather than displaying all the data in the grid at once, you can let users page through the data. For the small quantity of data that you're working with here, paging isn't very important. But if you've got hundreds or thousands of data rows to display, paging is very handy.

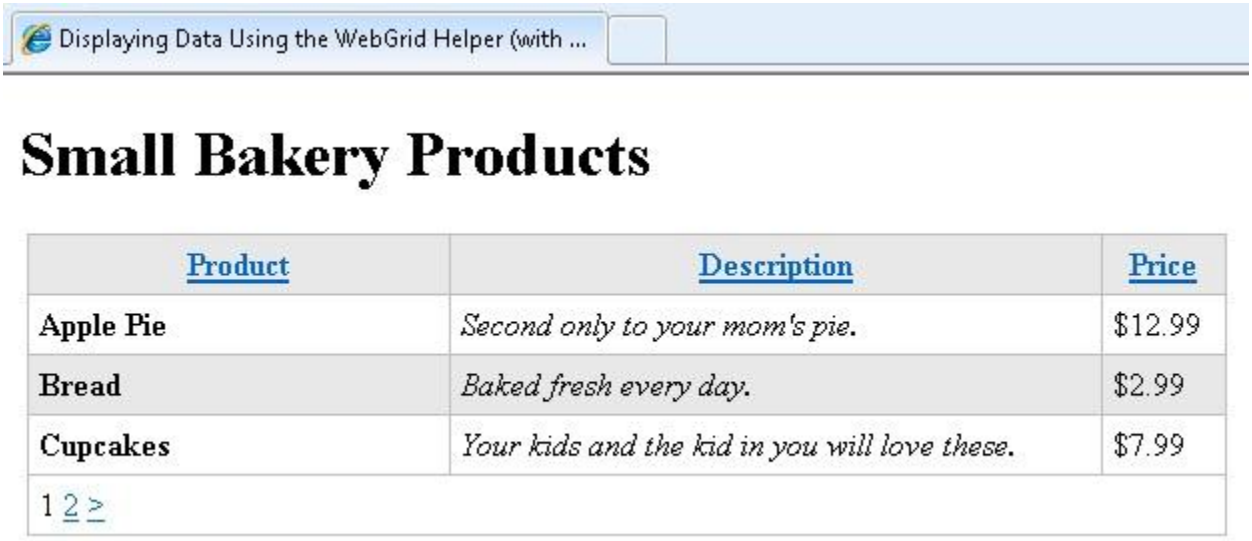
To add paging to the rendered grid, you specify an additional parameter for the `WebGrid` helper.

1. In the website, create a new page named *WebGridPaging.cshtml*.
2. Replace the existing markup with the following:

```
@{
    var db = Database.Open("SmallBakery");
    var selectQueryString = "SELECT * FROM Product ORDER BY Id";
    var data = db.Query(selectQueryString);
    var grid = new WebGrid(source: data,
                           defaultSort: "Name",
                           rowsPerPage: 3);
}
<!DOCTYPE html>
<html>
    <head>
        <title>Displaying Data Using the WebGrid Helper (with Paging)</title>
        <style type="text/css">
            .grid { margin: 4px; border-collapse: collapse; width: 600px; }
            .head { background-color: #E8E8E8; font-weight: bold; color: #FFF; }
            .grid th, .grid td { border: 1px solid #C0C0C0; padding: 5px; }
            .alt { background-color: #E8E8E8; color: #000; }
            .product { width: 200px; font-weight:bold;}
        </style>
    </head>
    <body>
        <h1>Small Bakery Products</h1>
        <div id="grid">
            @grid.GetHtml(
                tableStyle: "grid",
                headerStyle: "head",
                alternatingRowStyle: "alt",
                columns: grid.Columns(
                    grid.Column("Name", "Product", style: "product"),
                    grid.Column("Description", format:@<i>@item.Description</i>),
                    grid.Column("Price", format:@<text>$@item.Price</text>)
                )
            )
        </div>
    </body>
</html>
```

This code expands the previous example by adding a `rowsPerPage` parameter when creating the `WebGrid` object. This parameter lets you set the number of rows that are displayed. By including this parameter, you automatically enable paging.

3. View the page in a browser. Notice that only three rows are shown. At the bottom of the grid, you see controls that let you page through the remaining data rows.



Additional Resources

- Chapter 5 - Working with Data
- Chapter 7 - Displaying Data in a Chart
- ASP.NET Web Pages with Razor Syntax Reference

Chapter 7 – Displaying Data in a Chart

This chapter explains how to display data in a chart.

In the previous chapters, you learned how to display data manually and in a grid. This chapter explains how to display data using the `Chart` helper.

What you'll learn

- How to display data in a chart.
- How to style charts using built-in themes.
- How to save charts and how to cache them for better performance.

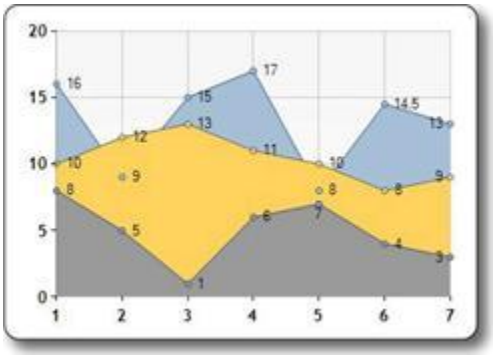
These are the ASP.NET programming features introduced in the chapter:

- The `Chart` helper.

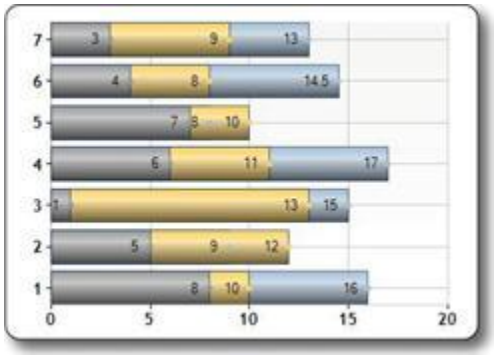
The Chart Helper

When you want to display your data in graphical form, you can use `Chart` helper. The `Chart` helper can render an image that displays data in a variety of chart types. It supports many options for formatting and labeling. The `Chart` helper can render more than 30 types of charts, including all the types of charts that you might be familiar with from Microsoft Excel or other tools — area charts, bar charts, column charts, line charts, and pie charts, along with more specialized charts like stock charts.

Area chart

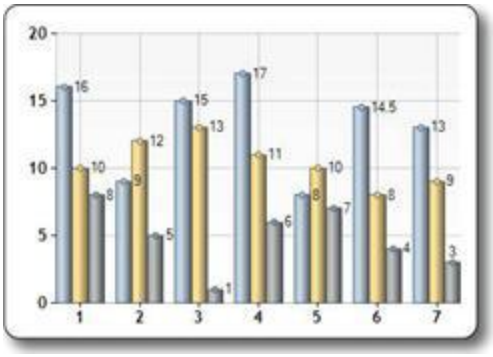


Bar chart

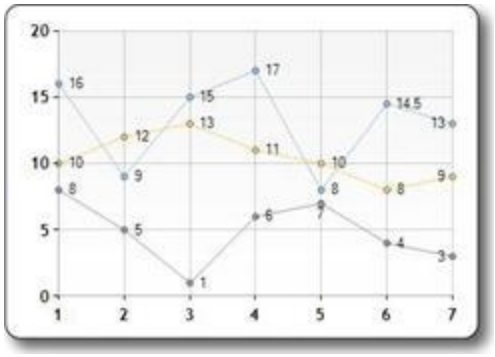


Column chart

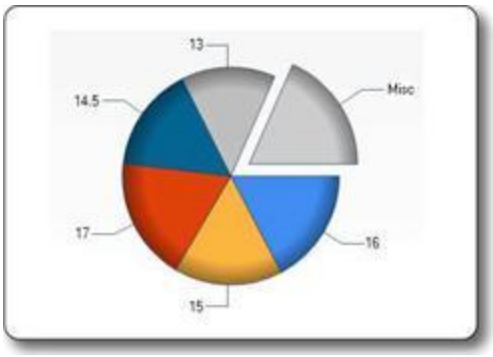
Line chart



Pie chart



Stock chart



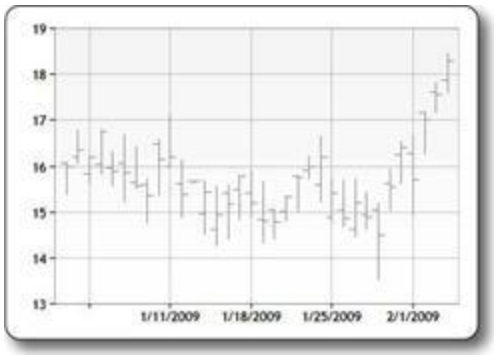
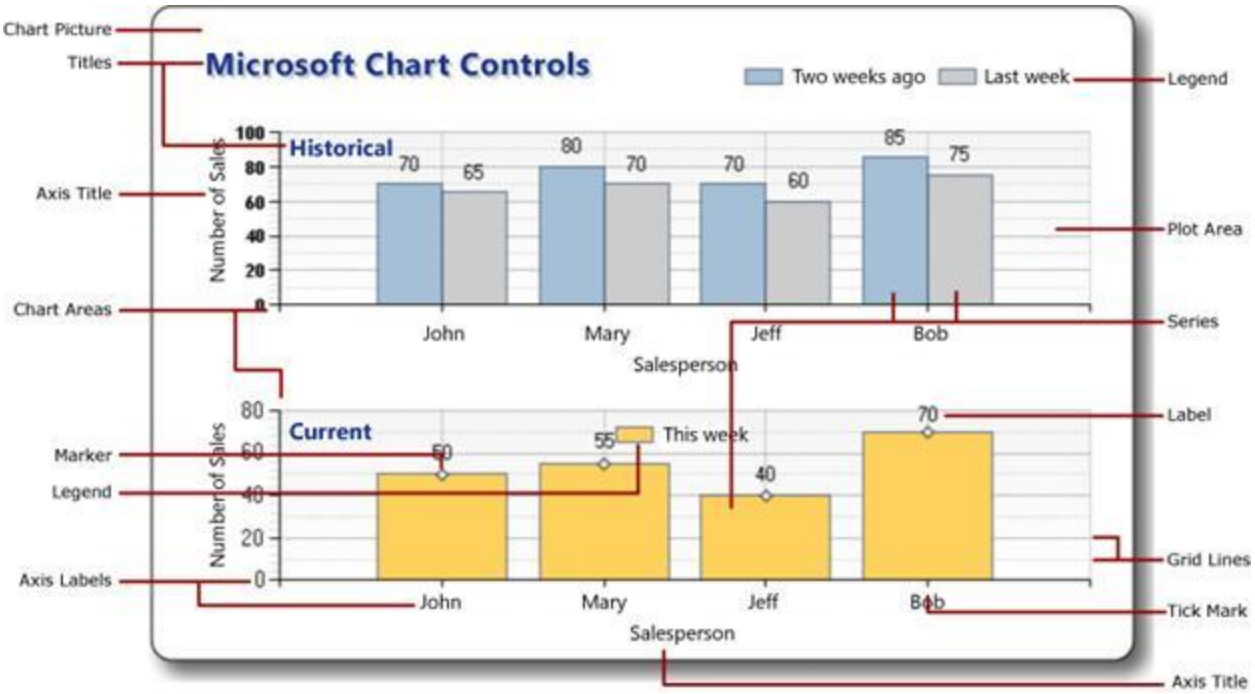


Chart Elements

Charts show data and additional elements like legends, axes, series, and so on. The following picture shows many of the chart elements that you can customize when you use the `Chart` helper. This chapter shows you how to set some (not all) of these elements.



Creating a Chart from Data

The data you display in a chart can be from an array, from the results returned from a database, or from data that's in an XML file.

Using an Array

As explained in Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax, an array lets you store a collection of similar items in a single variable. You can use arrays to contain the data that you want to include in your chart.

This procedure shows how you can create a chart from data in arrays, using the default chart type. It also shows how to display the chart within the page.

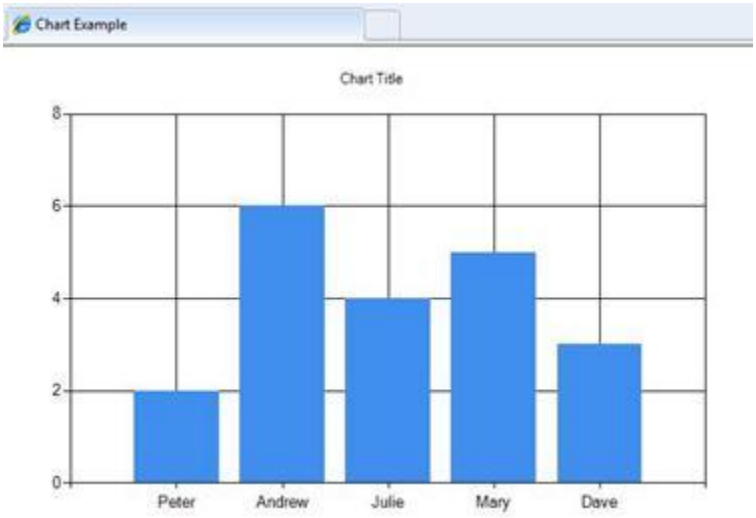
1. Create a new file named *ChartArrayBasic.cshtml*.
2. Replace the existing code with the following:

```
@{
    var myChart = new Chart(width: 600, height: 400)
        .AddTitle("Chart Title")
        .AddSeries(
            name: "Employee",
            xValue: new[] {  "Peter", "Andrew", "Julie", "Mary", "Dave" },
            yValues: new[] { "2", "6", "4", "5", "3" })
        .Write();
}
```

The code first creates a new chart and sets its width and height. You specify the chart title by using the `AddTitle` method. To add data, you use the `AddSeries` method. In this example, you use the `name`, `xValue`, and `yValues` parameters of the `AddSeries` method. The `name` parameter is displayed in the chart legend. The `xValue` parameter contains an array of data that's displayed along the horizontal axis of the chart. The `yValues` parameter contains an array of data that's used to plot the vertical points of the chart.

The `Write` method actually renders the chart. In this case, because you didn't specify a chart type, the `Chart` helper renders its default chart, which is a column chart.

3. Run the page in the browser. (Make sure the page is selected in the **Files** workspace before you run it.) The browser displays the chart.



Using a Database Query for Chart Data

If the information you want to chart is in a database, you can run a database query and then use data from the results to create the chart. This procedure shows you how to read and display the data that you created in the previous example.

1. Add an *App_Data* folder to the root of the website if the folder does not already exist.
2. In the *App_Data* folder, add the database file named *SmallBakery.sdf* that you created in Chapter 5 - Working with Data.
3. Create a new file named *ChartDataQuery.cshtml*.
4. Replace the existing code with the following:

```
@{
    var db = Database.Open("SmallBakery");
    var data = db.Query("SELECT Name, Price FROM Product");
    var myChart = new Chart(width: 600, height: 400)
        .AddTitle("Product Sales")
        .DataBindTable(dataSource: data, xField: "Name")
        .Write();
```

```
}
```

The code first opens the SmallBakery database and assigns it to a variable named `db`. This variable represents a `Database` object that can be used to read from and write to the database. Next, the code runs a SQL query to get the name and price of each product. The code creates a new chart and passes the database query to it by calling the chart's `DataBindTable` method. This method takes two parameters: the `dataSource` parameter is for the data from the query, and the `xField` parameter lets you set which data column is used for the chart's x-axis.

As an alternative to using the `DataBindTable` method, you can use the `AddSeries` method of the `Chart` helper. The `AddSeries` method lets you set the `xValue` and `yValues` parameters. For example, instead of using the `DataBindTable` method like this:

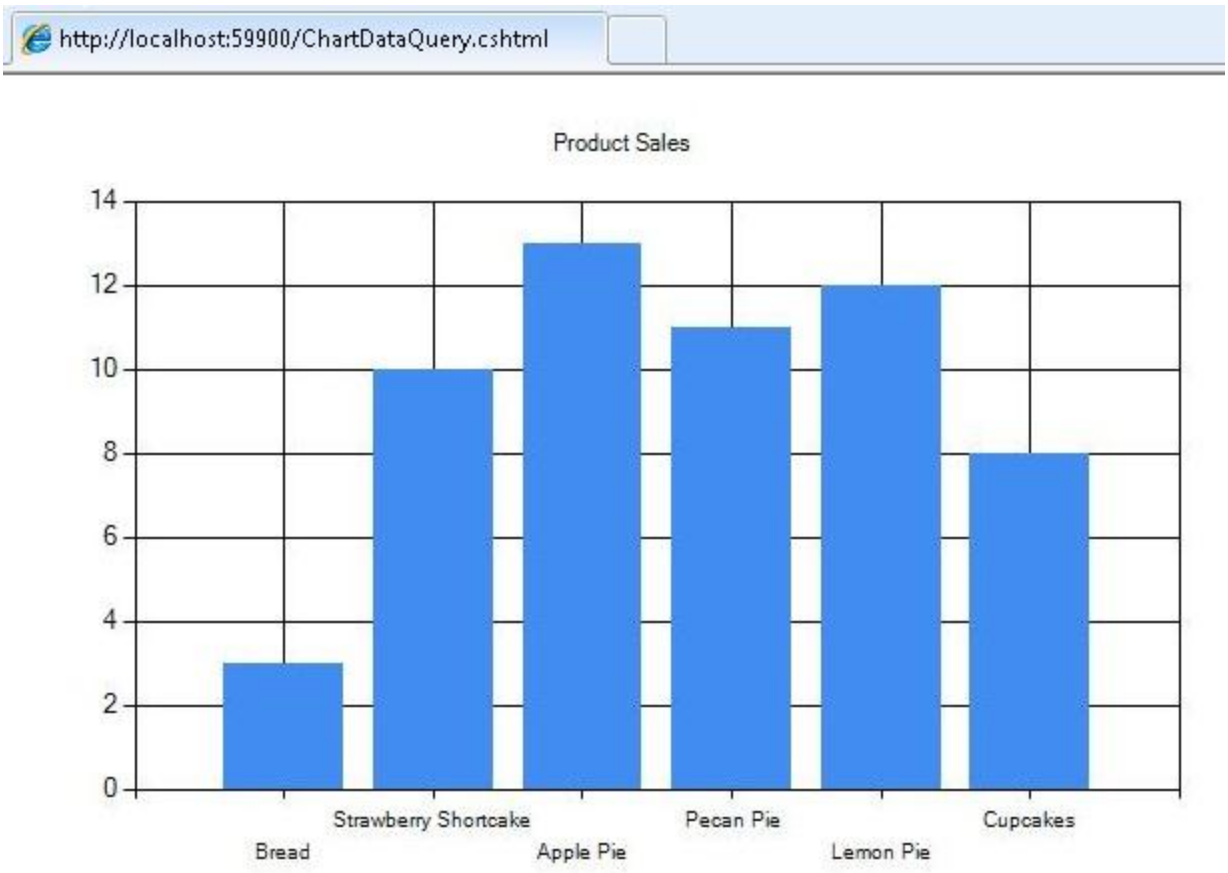
```
.DataBindTable(data, "Name")
```

You can use the `AddSeries` method like this:

```
.AddSeries("Default",
    xValue: data, xField: "Name",
    yValues: data, yFields: "Price")
```

Both render the same results. The `AddSeries` method is more flexible because you can specify the chart type and data more explicitly, but the `DataBindTable` method is easier to use if you don't need the extra flexibility.

5. Run the page in a browser.



Using XML Data

The third option for charting is to use an XML file as the data for the chart. This requires that the XML file also have a schema file (*.xsd* file) that describes the XML structure. This procedure shows you how to read data from an XML file.

1. In the *App_Data* folder, create a new XML file named *data.xml*.
2. Replace the existing XML with the following, which is some XML data about employees in a fictional company.

```
<?xml version="1.0" standalone="yes" ?>
<NewDataSet xmlns="http://tempuri.org/data.xsd">
    <Employee>
        <Name>Erin</Name>
        <Sales>10440</Sales>
    </Employee>
    <Employee>
        <Name>Kim</Name>
        <Sales>17772</Sales>
    </Employee>
    <Employee>
        <Name>Dean</Name>
        <Sales>23880</Sales>
    </Employee>
```

```
    <Employee>
        <Name>David</Name>
        <Sales>7663</Sales>
    </Employee>
    <Employee>
        <Name>Sanjay</Name>
        <Sales>21773</Sales>
    </Employee>
    <Employee>
        <Name>Michelle</Name>
        <Sales>32294</Sales>
    </Employee>
</NewDataSet>
```

3. In the *App_Data* folder, create a new XML file named *data.xsd*. (Note that the extension this time is *.xsd*.)
4. Replace the existing XML with the following:

```
<?xml version="1.0" ?>
<xs:schema
    id="NewDataSet"
    targetNamespace="http://tempuri.org/data.xsd"
    xmlns:mstns="http://tempuri.org/data.xsd"
    xmlns="http://tempuri.org/data.xsd"
    xmlns:xs="http://www.w3.org/2001/XMLSchema"
    xmlns:msdata="urn:schemas-microsoft-com:xml-msdata"
    attributeFormDefault="qualified"
    elementFormDefault="qualified">
    <xs:element name="NewDataSet"
        msdata:IsDataSet="true"
        msdata:EnforceConstraints="False">
        <xs:complexType>
            <xs:choice maxOccurs="unbounded">
                <xs:element name="Employee">
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element
                                name="Name"
                                type="xs:string"
                                minOccurs="0" />
                            <xs:element
                                name="Sales"
                                    type="xs:double"
                                    minOccurs="0" />
                        </xs:sequence>
                    </xs:complexType>
                </xs:element>
            </xs:choice>
        </xs:complexType>
    </xs:element>
</xs:schema>
```

5. In the root of the website, create a new file named *ChartDataXML.cshtml*.
6. Replace the existing code with the following:

```
@using System.Data;
```

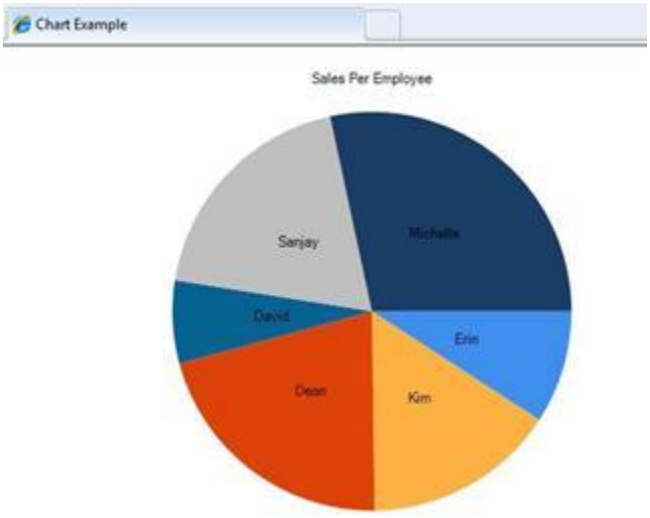
```
@{
    var dataSet = new DataSet();
    dataSet.ReadXmlSchema(Server.MapPath("~/App_Data/data.xsd"));
    dataSet.ReadXml(Server.MapPath("~/App_Data/data.xml"));
    var dataView = new DataView(dataSet.Tables[0]);

    var myChart = new Chart(width: 600, height: 400)
        .AddTitle("Sales Per Employee")
        .AddSeries("Default", chartType: "Pie",
            xValue: dataView, xField: "Name",
            yValues: dataView, yFields: "Sales")
        .Write();
}
```

The code first creates a `DataSet` object. This object is used to manage the data that's read from the XML file and organize it according to the information in the schema file. (Notice that the top of the code includes the statement `using SystemData`. This is required in order to be able to work with the `DataSet` object. For more information, see the sidebar "Using" Statements and Fully Qualified Names.)

Next, the code creates a `DataView` object based on the dataset. The data view provides an object that the chart can bind to — that is, read and plot. The chart binds to the data using the `AddSeries` method, as you saw earlier when charting the array data, except that this time the `xValue` and `yValues` parameters are set to the `DataView` object.

This example also shows you how to specify a particular chart type. When the data is added in the `AddSeries` method, the `chartType` parameter is also set to display a pie chart.

7. Run the page in a browser.



"Using" Statements and Fully Qualified Names

The .NET Framework that ASP.NET Web Pages with Razor syntax is based on consists of thousands and thousands of components (classes). To make it manageable to work with all these classes, they're organized into *namespaces*, which are somewhat like libraries. For example, the `System.Web` namespace contains classes that support browser/server communication, the `System.Xml` namespace contains classes that are used to create and read XML files, and the `System.Data` namespace contains classes that let you work with data.

In order to access any given class in the .NET Framework, code needs to know not just the class name, but also the namespace that the class is in. For example, in order to use the `Chart` helper, code needs to find the `System.Web.Helpers.Chart` class, which combines the namespace (`System.Web.Helpers`) with the class name (`Chart`). This is known as the class's *fully-qualified* name — its complete, unambiguous location within the vastness of the .NET Framework. In code, this would look like the following:

```
var myChart = new System.Web.Helpers.Chart(width: 600, height: 400) // etc.
```

However, it's cumbersome (and error prone) to have to use these long, fully-qualified names every time you want to refer to a class or helper. Therefore, to make it easier to use class names, you can *import* the namespaces you're interested in, which is usually is just a handful from among the many namespaces in the .NET Framework. If you've imported a namespace, you can use just a class name (`Chart`) instead of the fully qualified name (`System.Web.Helpers.Chart`). When your code runs and encounters a class name, it can look in just the namespaces you've imported to find that class.

When you use ASP.NET Web Pages with Razor syntax to create web pages, you typically use the same set of classes each time, including the `WebPage` class, the various helpers, and so on. To save you the work of importing the relevant namespaces every time you create a website, ASP.NET is configured so it automatically imports a set of core namespaces for every website. That's why you haven't had to deal with namespaces or importing up to now; all the classes you've worked with are in namespaces that are already imported for you.

However, sometimes you need to work with a class that isn't in a namespace that's automatically imported for you. In that case, you can either use that class's fully-qualified name, or you can manually import the namespace that contains the class. To import a namespace, you use the `using` statement (`import` in Visual Basic), as you saw in an example earlier the chapter.

For example, the `DataSet` class is in the `System.Data` namespace. The `System.Data` namespace is not automatically available to ASP.NET Razor pages. Therefore, to work with the `DataSet` class using its fully qualified name, you can use code like this:

```
var dataSet = new System.Data.DataSet();
```

If you have to use the `DataSet` class repeatedly you can import a namespace like this and then use just the class name in code:

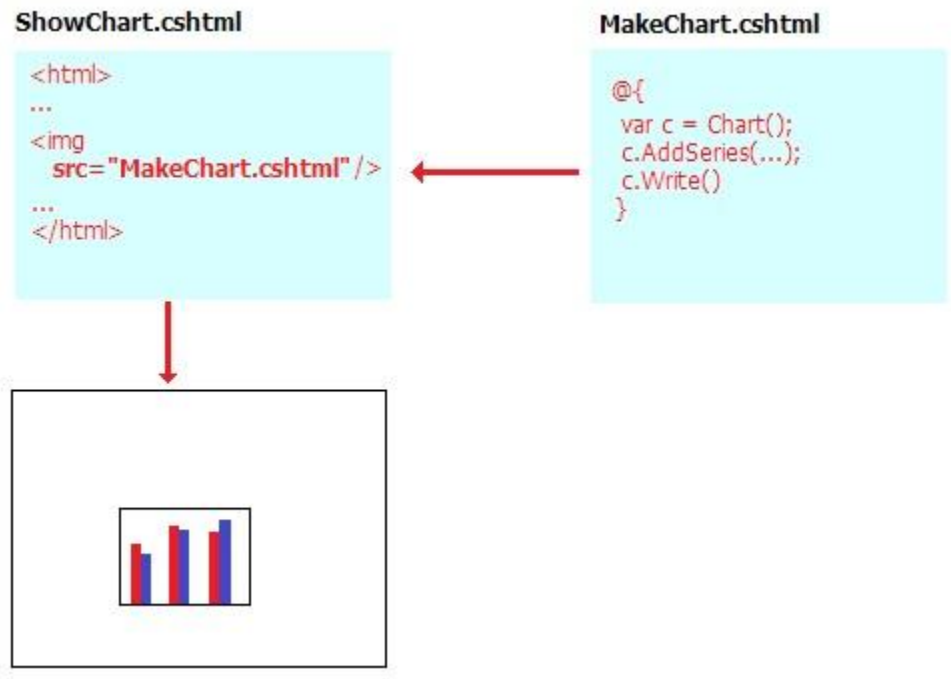
```
@using System.Data;
@{
    var dataSet = new DataSet();
    // etc.
}
```

You can add `using` statements for any other .NET Framework namespaces that you want to reference. However, as noted, you won't need to do this often, because most of the classes that you'll work with are in namespaces that are imported automatically by ASP.NET for use in *.cshtml* and *.vbhtml* pages.

Displaying Charts Inside a Web Page

In the examples you've seen so far, you create a chart and then the chart is rendered directly to the browser as a graphic. In many cases, though, you want to display a chart as part of a page, not just by itself in the browser. To do that requires a two-step process. The first step is to create a page that generates the chart, as you've already seen.

The second step is to display the resulting image in another page. To display the image, you use an HTML `<img>` element, in the same way you would to display any image. However, instead of referencing a *.jpg* or *.png* file, the `<img>` element references the *.cshtml* file that contains the `Chart` helper that creates the chart. When the display page runs, the `<img>` element gets the output of the `Chart` helper and renders the chart.



1. Create a file named *ShowChart.cshtml*.
2. Replace the existing code with the following:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Chart Example</title>
  </head>
  <body>
    <h1>Chart Example</h1>
    <p>The following chart is generated by the <em>ChartArrayBasic.cshtml</em> file,
but is shown
       in this page.</p>
    <p><img src="ChartArrayBasic.cshtml" /> </p>
  </body>
</html>
```

The code uses the `<img>` element to display the chart that you created earlier in the *ChartArrayBasic.cshtml* file.

3. Run the web page in a browser. The *ShowChart.cshtml* file displays the chart image based on the code contained in the *ChartArrayBasic.cshtml* file.

Styling a Chart

The `Chart` helper supports a large number of options that let you customize the appearance of the chart. You can set colors, fonts, borders, and so on. An easy way to customize the appearance of a chart is to use a *theme*. Themes are collections of information that specify how to render a chart using fonts, colors, labels, palettes, borders, and effects. (Note that the style of a chart does not indicate the type of chart.)

The following table lists built-in themes.

Theme	Description
`Vanilla`	Displays red columns on a white background.
`Blue`	Displays blue columns on a blue gradient background.
`Green`	Displays blue columns on a green gradient background.
`Yellow`	Displays orange columns on a yellow gradient background.
`Vanilla3D`	Displays 3-D red columns on a white background.

You can specify the theme to use when you create a new chart.

1. Create a new file named *ChartStyleGreen.cshtml*.
2. Replace the default markup and code in the page with the following:

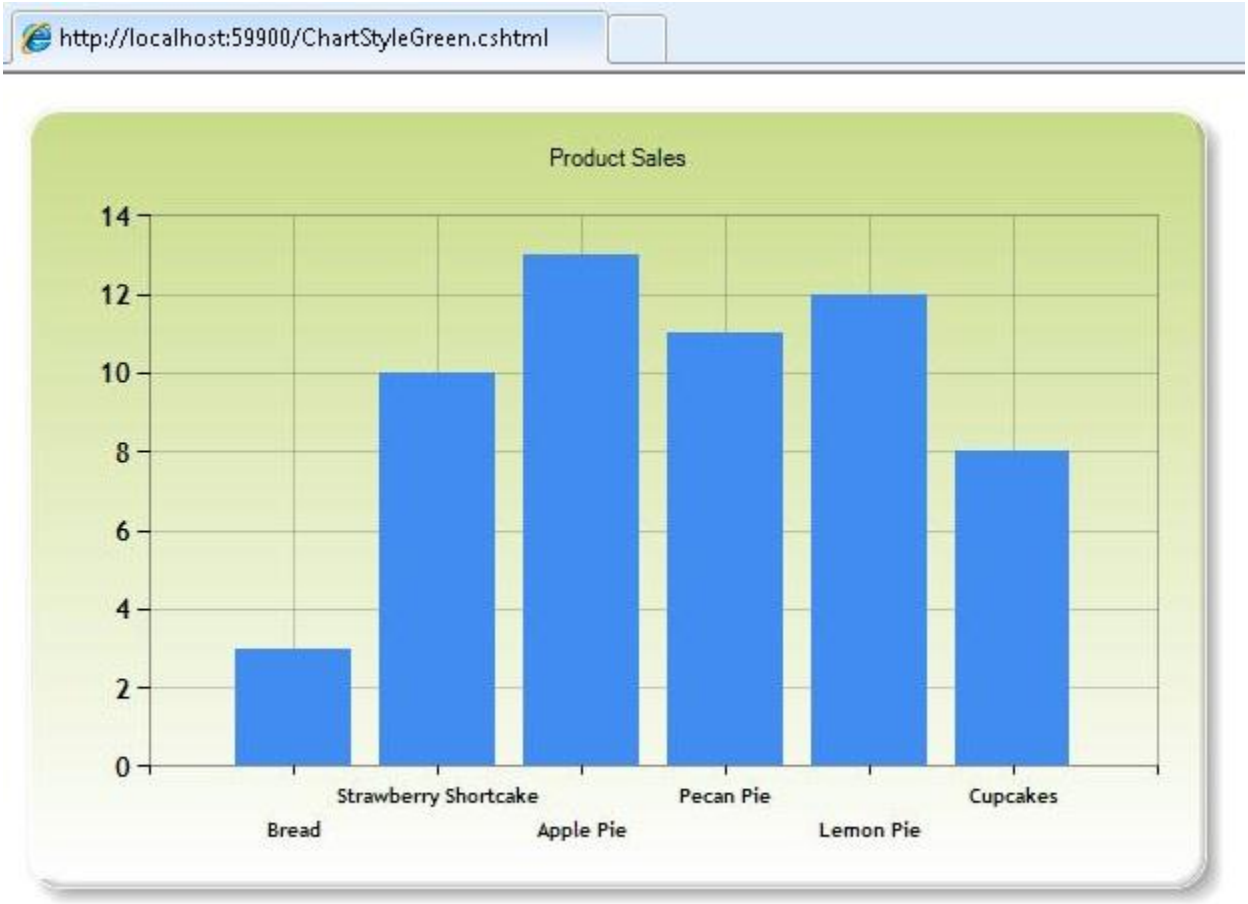
```
@{
    var db = Database.Open("SmallBakery");
    var data = db.Query("SELECT Name, Price FROM Product");
    var myChart = new Chart(width: 600,
                        height: 400,
```

```
                        theme: ChartTheme.Green)
        .AddTitle("Product Sales")
        .DataBindTable(data, "Name")
        .Write();
}
```

This code is the same as the earlier example that uses the database for data, but adds the `theme` parameter when it creates the `Chart` object. The following shows the changed code:

```
var myChart = new Chart(width: 600,
                    height: 400,
                    theme: ChartTheme.Green)
```

3. Run the page in a browser. You see the same data as before, but the chart looks more polished:



Saving a Chart

When you use the `Chart` helper as you've seen so far in this chapter, the helper re-creates the chart from scratch each time it's invoked. If necessary, the code for the chart also re-queries the database or re-reads the XML file to get the data. In some cases, doing this can be a complex operation, such as if

the database that you're querying is large, or if the XML file contains a lot of data. Even if the chart doesn't involve a lot of data, the process of dynamically creating an image takes up server resources, and if many people request the page or pages that display the chart, there can be an impact on the performance of your website.

To help you reduce the potential performance impact of creating a chart, you can create a chart the first time you need it and then save it. When the chart is needed again, rather than regenerating it, you can just fetch the saved version and render that.

You can save a chart in these ways:

- Cache the chart in computer memory (on the server).
- Save the chart as an image file.
- Save the chart as an XML file. This option lets you modify the chart before you save it.

Caching a Chart

After you've created a chart, you can cache it. Caching a chart means that it doesn't have to be re-created if it needs to be displayed again. When you save a chart in the cache, you give it a key that must be unique to that chart.

Charts saved to the cache might be removed if the server runs low on memory. In addition, the cache is cleared if your application restarts for any reason. Therefore, the standard way to work with a cached chart is to always check first whether it's available in the cache, and if not, then to create or re-create it.

1. At the root of your website, create a file named *ShowCachedChart.cshtml*.
2. Replace the existing code with the following:

```
<!DOCTYPE html>
<html>
    <head>
        <title>Chart Example</title>
    </head>
<body>
    <h1>Chart Example</h1>
    <img src="ChartSaveToCache.cshtml?key=myChartKey" />
</body>
</html>
```

   The `<img>` tag includes a `src` attribute that points to the *ChartSaveToCache.cshtml* file and passes a key to the page as a query string. The key contains the value "myChartKey". The *ChartSaveToCache.cshtml* file contains the `Chart` helper that creates the chart. You'll create this page next.

3. At the root of your website, create a new file named *ChartSaveToCache.cshtml*.
4. Replace the existing code with the following:

```
@{
```

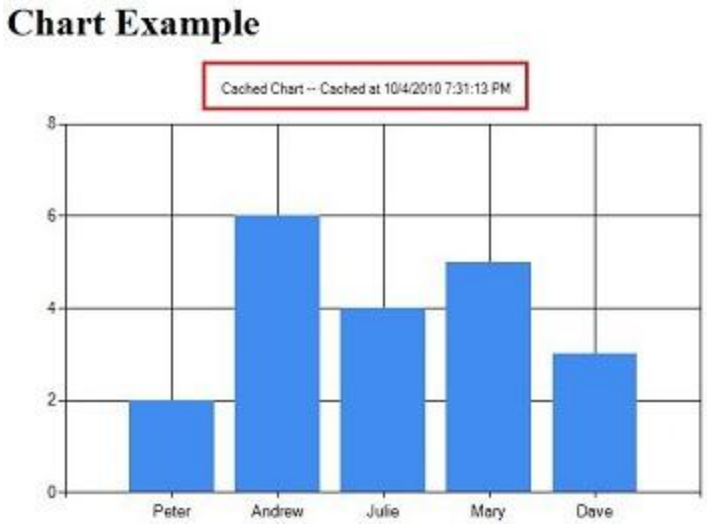
```
    var chartKey = Request["key"];
    if (chartKey != null) {
        var cachedChart = Chart.GetFromCache(key: chartKey);
        if (cachedChart == null) {
            cachedChart = new Chart(600, 400);
            cachedChart.AddTitle("Cached Chart -- Cached at " + DateTime.Now);
            cachedChart.AddSeries(
               name: "Employee",
               axisLabel: "Name",
               xValue: new[] { "Peter", "Andrew", "Julie", "Mary", "Dave" },
               yValues: new[] { "2", "6", "4", "5", "3" });
            cachedChart.SaveToCache(key: chartKey,
               minutesToCache: 2,
               slidingExpiration: false);
        }
        Chart.WriteFromCache(chartKey);
    }
}
```

The code first checks whether anything was passed as the key value in the query string. If so, the code tries to read a chart out of the cache by calling the `GetFromCache` method and passing it the key. If it turns out that there's nothing in the cache under that key (which would happen the first time that the chart is requested), the code creates the chart as usual. When the chart is finished, the code saves it to the cache by calling `SaveToCache`. That method requires a key (so the chart can be requested later), and the amount of time that the chart should be saved in the cache. (The exact time you'd cache a chart would depend on how often you thought the data it represents might change.) The `SaveToCache` method also requires a `slidingExpiration` parameter — if this is set to true, the timeout counter is reset each time the chart is accessed. In this case, it in effect means that the chart's cache entry expires 2 minutes after the last time someone accessed the chart. (The alternative to sliding expiration is absolute expiration, meaning that the cache entry would expire exactly 2 minutes after it was put into the cache, no matter how often it had been accessed.)

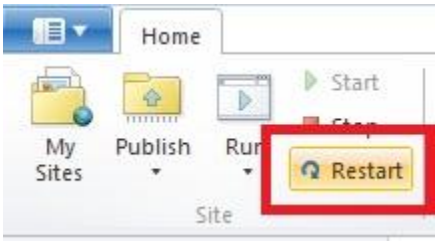
Finally, the code uses the `WriteFromCache` method to fetch and render the chart from the cache. Note that this method is outside the `if` block that checks the cache, because it will get the chart from the cache whether the chart was there to begin with or had to be generated and saved in the cache.

Notice that in the example, the `AddTitle` method includes a timestamp. (It adds the current date and time — `DateTime.Now` — to the title.)

5. Run the *ShowCachedChart.cshtml* web page in a browser. The page displays the chart image based on the code contained in the *ChartSaveToCache.cshtml* file. Take note of what the timestamp says in the chart title.



6. Close the browser.
7. Run the *ShowCachedChart.cshtml* again. Notice that the timestamp is the same as before, which indicates that the chart was not regenerated, but was instead read from the cache.
8. In WebMatrix, in the **Site** group of the **Home** tab on the ribbon, click **Restart**. This stops and then restarts IIS Express, which has the effect of restarting your website application.



Alternatively, wait two minutes for the cache entry to expire.

9. Run the *ShowCachedChart.cshtml* again. Notice that this time the timestamp has changed, because restarting the application also clears the cache. Therefore, the code had to regenerate the chart and put it back into the cache.

Saving a Chart as an Image File

You can also save a chart as an image file (for example, as a *.jpg* file) on the server. You can then use the image file the way you would any image. The advantage is the file is stored rather than saved to a temporary cache. You can save a new chart image at different times (for example, every hour) and then keep a permanent record of the changes that occur over time. Note that you must make sure that your web application has permission to save a file to the folder on the server where you want to put the image file.

1. At the root of your website, create a folder named *_ChartFiles* if it does not already exist.
2. At the root of your website, create a new file named *ChartSave.cshtml*.
3. Replace the existing code with the following:

```
@{
    var filePathName = "_ChartFiles/chart01.jpg";
    if (!File.Exists(Server.MapPath(filePathName))) {
        var chartImage = new Chart(600, 400);
        chartImage.AddTitle("Chart Title");
        chartImage.AddSeries(
                name: "Employee",
                axisLabel: "Name",
                xValue: new[] {  "Peter", "Andrew", "Julie", "Mary", "Dave" },
                yValues: new[] { "2", "6", "4", "5", "3" });
        chartImage.Save(path: filePathName);
    }
}
<!DOCTYPE html>
<html>
    <head>
        <title>Chart Example</title>
    </head>
    <body>
        <img src="@filePathName" />
    </body>
</html>
```

The code first checks to see whether the *.jpg* file exists by calling the `File.Exists` method. If the file does not exist, the code creates a new `Chart` from an array. This time, the code calls the `Save` method and passes the `path` parameter to specify the file path and file name of where to save the chart. In the body of the page, an `<img>` element uses the path to point to the *.jpg* file to display.

4. Run the *ChartSave.cshtml* file.

Saving a Chart as an XML File

Finally, you can save a chart as an XML file on the server. An advantage of using this method over caching the chart or saving the chart to a file is that you could modify the XML before displaying the chart if you wanted to. Your application has to have read/write permissions for the folder on the server where you want to put the image file.

1. At the root of your website, create a new file named *ChartSaveXml.cshtml*.
2. Replace the existing code with the following:

```
@{
    Chart chartXml;
    var filePathName = "_ChartFiles/XmlChart.xml";
    if (File.Exists(Server.MapPath(filePathName))) {
        chartXml = new Chart(width: 600,
                             height: 400,
                             themePath: filePathName);
    }
    else {
        chartXml = new Chart(width: 600,
                             height: 400);
        chartXml.AddTitle("Chart Title -- Saved at " + DateTime.Now);
```

```
        chartXml.AddSeries(
            name: "Employee",
            axisLabel: "Name",
            xValue: new[] { "Peter", "Andrew", "Julie", "Mary", "Dave" },
            yValues: new[] { "2", "6", "4", "5", "3" });
        chartXml.SaveXml(path: filePathName);
    }
    chartXml.Write();
}
```

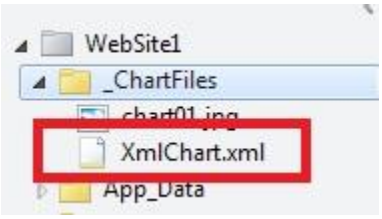
This code is similar to the code that you saw earlier for storing a chart in the cache, except that it uses an XML file. The code first checks to see whether the XML file exists by calling the `File.Exists` method. If the file does exist, the code creates a new `Chart` object and passes the file name as the `themePath` parameter. This creates the chart based on whatever's in the XML file. If the XML file doesn't already exist, the code creates a chart like normal and then calls `SaveXml` to save it. The chart is rendered using the `Write` method, as you've seen before.

As with the page that showed caching, this code includes a timestamp in the chart title.

3. Create a new page named *ChartDisplayXMLChart.cshtml* and add the following markup to it:

```
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8" />
    <title>Display chart from XML</title>
  </head>
  <body>
    <img src="ChartSaveXML.cshtml" />
  </body>
</html>
```

4. Run the *ChartDisplayXMLChart.cshtml* page. The chart is displayed. Take note of the timestamp in the chart's title.
5. Close the browser.
6. In WebMatrix, right-click the *_ChartFiles* folder, click **Refresh**, and then open the folder. The *XMLChart.xml* file in this folder was created by the `Chart` helper.



7. Run the *ChartDisplayXMLChart.cshtml* page again. The chart shows the same timestamp as the first time you ran the page. That's because the chart is being generated from the XML you saved earlier.
8. In WebMatrix, open the *_ChartFiles* folder and delete the *XMLChart.xml* file.

9. Run the *ChartDisplayXMLChart.cshtml* page once more. This time, the timestamp is updated, because the `Chart` helper had to recreate the XML file. If you want, check the *_ChartFiles* folder and notice that the XML file is back.

Additional Resources

- Chapter 5 - Working with Data
- Chapter 6 - Displaying Data in a Grid
- Chapter 15 - Caching to Improve the Performance of Your Website
- Chart Controls
- ASP.NET Web Pages with Razor Syntax Reference

Chapter 8 – Working with Files

This chapter explains how to read, write, append, delete, and upload files.

In previous chapters, you learned how to store data in a database. However, you might also work with text files in your website. For example, you might use text files as a simple way to store data for the site. (A text file that's used to store data is sometimes called a *flat file*.) Text files can be in different formats, like *.txt*, *.xml*, or *.csv* (comma-delimited values).

What you'll learn

- How to create a text file and write data to it.
- How to append data to an existing file.
- How to read a file and display from it.
- How to delete files from a website.
- How to let users upload one file or multiple files.

These are the ASP.NET programming features introduced in the chapter:

- The `File` object, which provides a way to manage files.
- The `FileUpload` helper.
- The `Path` object, which provides methods that let you manipulate path and file names.

> **Note** If you want to upload images and manipulate them (for example, flip or resize them), see Chapter 9 - Working with Images.

Creating a Text File and Writing Data to It

If you want to store data in a text file, you can use the `File.WriteAllText` method to specify the file to create and the data to write to it. In this procedure, you'll create a page that contains a simple form with three `input` elements (first name, last name, and email address) and a **Submit** button. When the user submits the form, you'll store the user's input in a text file.

1. Create a new folder named *App_Data*, if it doesn't exist already.
2. At the root of your website, create a new file named *UserData.cshtml*.
3. Replace the default markup and code with the following:

```
@{
    var result = "";
    if (IsPost)
    {
        var firstName = Request["FirstName"];
        var lastName = Request["LastName"];
        var email = Request["Email"];

        var userData = firstName + "," + lastName +
```

```
            "," + email + Environment.NewLine;

        var dataFile = Server.MapPath("~/App_Data/data.txt");
        File.WriteAllText(@dataFile, userData);
        result = "Information saved.";
    }
}
<!DOCTYPE html>
<html>
<head>
    <title>Write Data to a File</title>
</head>
<body>
    <form id="form1" method="post">
    <div>
        <table>
            <tr>
                <td>First Name:</td>
                <td><input id="FirstName" name="FirstName" type="text" /></td>

            </tr>
            <tr>
                <td>Last Name:</td>
                <td><input id="LastName" name="LastName" type="text" /></td>
            </tr>
            <tr>
                <td>Email:</td>
                <td><input id="Email" name="Email" type="text" /></td>
            </tr>
            <tr>
                <td></td>
                <td><input type="submit" value="Submit"/></td>
            </tr>
        </table>
    </div>
    <div>
    @if(result != ""){
        <p>Result: @result</p>
    }
    </div>
    </form>
</body>
</html>
```

The HTML markup creates the form with the three text boxes. In the code, you use the `IsPost` property to determine whether the page has been submitted before you start processing.

The first task is to get the user input and assign it to variables. The code then concatenates the values of the separate variables into one comma-delimited string, which is then stored in a different variable. Notice that the comma separator is a string contained in quotation marks (","), because you're literally embedding a comma into the big string that you're creating. At the end of the data that you concatenate together, you add `Environment.NewLine`. This adds a line break (a newline character). What you're creating with all this concatenation is a string that looks like this:

```
David,Jones,davidj@contoso.com
```

(With an invisible line break at the end.)

You then create a variable (`dataFile`) that contains the location and name of the file to store the data in. Setting the location requires some special handling. In websites, it's a bad practice to refer in code to absolute paths like *C:\Folder\File.txt* for files on the web server. If a website is moved, an absolute path will be wrong. Moreover, for a hosted site (as opposed to on your own computer) you typically don't even know what the correct path is when you're writing the code.

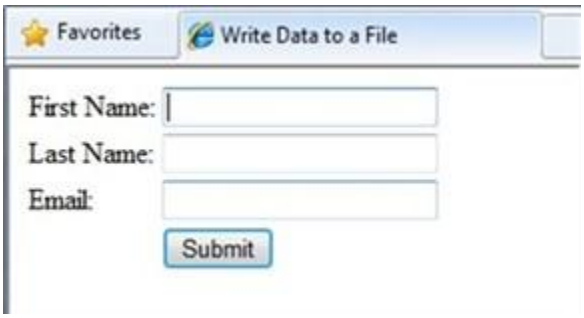
But sometimes (like now, for writing a file) you do need a complete path. The solution is to use the `MapPath` method of the `Server` object. This returns the complete path to your website. To get the path for the website root, you pass "~" to `MapPath`. (You can also pass a subfolder name to it, like *~/App_Data/*, to get the path for that subfolder.) You can then concatenate additional information onto whatever the method returns in order to create a complete path. In this example, you add a file name. (You can read more about how to work with file and folder paths in Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax.)

The file is saved in the *App_Data* folder. This folder is a special folder in ASP.NET that's used to store data files, as described in Chapter 5 - Working with Data.

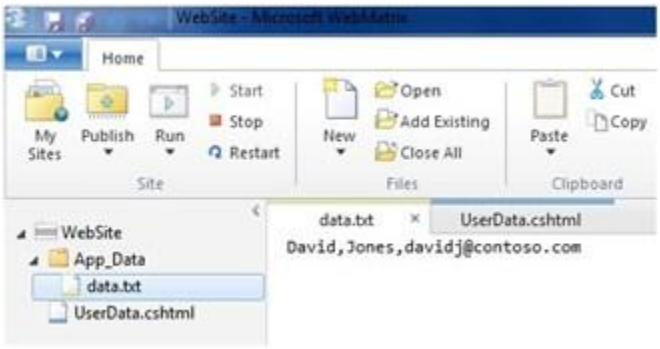
The `WriteAllText` method of the `File` object writes the data to the file. This method takes two parameters: the name (with path) of the file to write to, and the actual data to write. Notice that the name of the first parameter has an @ character as a prefix. This tells ASP.NET that you're providing a verbatim string literal, and that characters like "/" should not be interpreted in special ways. (For more information, see Chapter 2.)

> **Note** In order for your code to save files in the *App_Data* folder, the application needs read-write permissions for that folder. On your development computer this is not typically an issue. However, when you publish your site to a hosting provider's web server, you might need to explicitly set those permissions. If you run this code on a hosting provider's server and get errors, check with the hosting provider to find out how to set those permissions.

4. Run the page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.)



5. Enter values into the fields and then click **Submit**.
6. Close the browser.
7. Return to the project and refresh the view.
8. Open the *data.txt* file. The data you submitted in the form is in the file.



9. Close the *data.txt* file.

Appending Data to an Existing File

In the previous example, you used `WriteAllText` to create a text file that's got just one piece of data in it. If you call the method again and pass it the same file name, the existing file is completely overwritten. However, after you've created a file you often want to add new data to the end of the file. You can do that using the `AppendAllText` method of the `File` object.

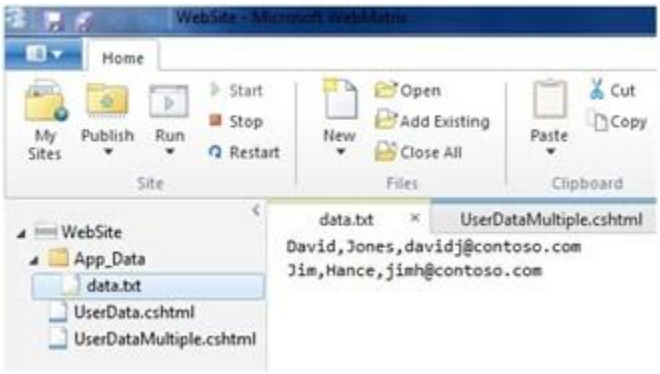
1. In the website, make a copy of the *UserData.cshtml* file and name the copy *UserDataMultiple.cshtml*.
2. Replace the code block before the opening `<!DOCTYPE html>` tag with the following code block:

```
@{
    var result = "";
    if (IsPost)
    {
        var firstName = Request["FirstName"];
        var lastName = Request["LastName"];
        var email = Request["Email"];

        var userData = firstName + "," + lastName +
            "," + email + Environment.NewLine;

        var dataFile = Server.MapPath("~/App_Data/data.txt");
        File.AppendAllText (@dataFile, userData);
        result = "Information saved.";
    }
}
```

This code has one change in it from the previous example. Instead of using `WriteAllText`, it uses the `AppendAllText` method. The methods are similar, except that `AppendAllText` adds the data

to the end of the file. As with `WriteAllText`, `AppendAllText` creates the file if it doesn't already exist.

3. Run the page in a browser.
4. Enter values for the fields and then click **Submit**.
5. Add more data and submit the form again.
6. Return to your project, right-click the project folder, and then click **Refresh**.
7. Open the *data.txt* file. It now contains the new data that you just entered.



Reading and Displaying Data from a File

Even if you don't need to write data to a text file, you'll probably sometimes need to read data from one. To do this, you can again use the `File` object. You can use the `File` object to read each line individually (separated by line breaks) or to read individual item no matter how they're separated.

This procedure shows you how to read and display the data that you created in the previous example.

1. At the root of your website, create a new file named *DisplayData.cshtml*.
2. Replace the existing code with the following:

```
@{
    var result = "";
    Array userData = null;
    char[] delimiterChar = {','};

    var dataFile = Server.MapPath("~/App_Data/data.txt");

    if (File.Exists(dataFile)) {
        userData = File.ReadAllLines(dataFile);
        if (userData == null) {
            // Empty file.
            result = "The file is empty.";
        }
    }
    else {
        // File does not exist.
        result = "The file does not exist.";
    }
```

```
}
<!DOCTYPE html>

<html>
<head>
    <title>Reading Data from a File</title>
</head>
<body>
    <div>
        <h1>Reading Data from a File</h1>
        @result
        @if (result == "") {
            <ol>
            @foreach (string dataLine in userData) {
            <li>
                User
                <ul>
                @foreach (string dataItem in dataLine.Split(delimiterChar)) {
                    <li>@dataItem</li >
                }
                </ul>
            </li>
            }
            </ol>
        }
    </div>
</body>
</html>
```

The code starts by reading the file that you created in the previous example into a variable named `userData`, using this method call:

```
File.ReadAllLines(dataFile)
```

The code to do this is inside an `if` statement. When you want to read a file, it's a good idea to use the `File.Exists` method to determine first whether the file is available. The code also checks whether the file is empty.

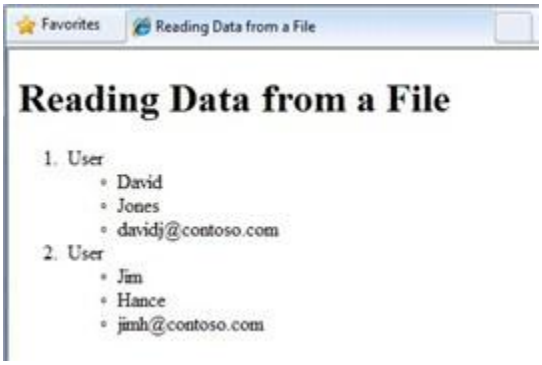
The body of the page contains two `foreach` loops, one nested inside the other. The outer `foreach` loop gets one line at a time from the data file. In this case, the lines are defined by line breaks in the file — that is, each data item is on its own line. The outer loop creates a new item (`<li>` element) inside an ordered list (`<ol>` element).

The inner loop splits each data line into items (fields) using a comma as a delimiter. (Based on the previous example, this means that each line contains three fields — the first name, last name, and email address, each separated by a comma.) The inner loop also creates a `<ul>` list and displays one list item for each field in the data line.

The code illustrates how to use two data types, an array and the `char` data type. The array is required because the `File.ReadAllLines` method returns data as an array. The `char` data type is required because the `Split` method returns an `array` in which each element is of the type `char`.

(For information about arrays, see Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax.)

3. Run the page in a browser. The data you entered for the previous examples is displayed.



Displaying Data from a Microsoft Excel Comma-Delimited File

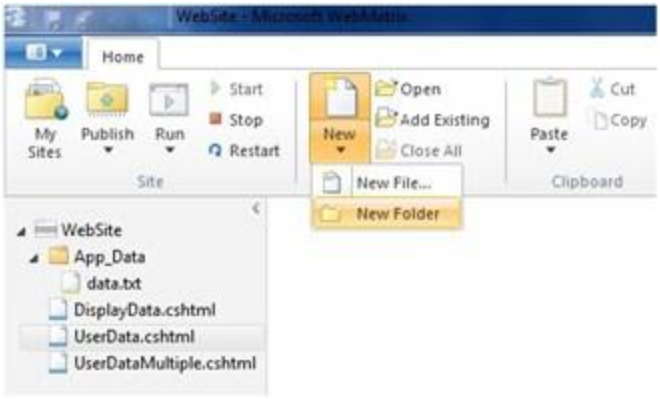
You can use Microsoft Excel to save the data contained in a spreadsheet as a comma-delimited file (*.csv* file). When you do, the file is saved in plain text, not in Excel format. Each row in the spreadsheet is separated by a line break in the text file, and each data item is separated by a comma. You can use the code shown in the previous example to read an Excel comma-delimited file just by changing the name of the data file in your code.

Deleting Files

To delete files from your website, you can use the `File.Delete` method. This procedure shows how to let users delete an image (*.jpg* file) from an *images* folder if they know the name of the file.

Important In a production website, you typically restrict who's allowed to make changes to the data. For information about how to set up membership and about ways to authorize users to perform tasks on the site, see Chapter 16 - Adding Security and Membership.

1. In the website, create a subfolder named *images*.



2. Copy one or more *.jpg* files into the *images* folder.
3. In the root of the website, create a new file named *FileDelete.cshtml*.
4. Replace the default markup and code with the following:

```
@{
    bool deleteSuccess = false;
    var photoName = "";
    if (IsPost) {
        photoName = Request["photoFileName"] + ".jpg";
        var fullPath = Server.MapPath("~/images/" + photoName);

        if (File.Exists(fullPath))
        {
                File.Delete(fullPath);
                deleteSuccess = true;
        }
    }
}
<!DOCTYPE html>
<html>
  <head>
    <title>Delete a Photo</title>
  </head>
  <body>
    <h1>Delete a Photo from the Site</h1>
    <form name="deletePhoto" action="" method="post">
      <p>File name of image to delete (without .jpg extension):
      <input name="photoFileName" type="text" value="" />
      </p>
      <p><input type="submit" value="Submit" </p>
    </form>

    @if(deleteSuccess) {
        <p>
        @photoName deleted!
        </p>
        }
  </body>
</html>
```

This page contains a form where users can enter the name of an image file. They don't enter the *.jpg* file-name extension; by restricting the file name like this, you help prevents users from deleting arbitrary files on your site.

The code reads the file name that the user has entered and then constructs a complete path. To create the path, the code uses the current website path (as returned by the `Server.MapPath` method), the *images* folder name, the name that the user has provided, and ".jpg" as a literal string.

To delete the file, the code calls the `File.Delete` method, passing it the full path that you just constructed. At the end of the markup, code displays a confirmation message that the file was deleted.

5. Run the page in a browser.

6. Enter the name of the file to delete and then click **Submit**. If the file was deleted, the name of the file is displayed at the bottom of the page.

Letting Users Upload a File

The `FileUpload` helper lets users upload files to your website. The procedure below shows you how to let users upload a single file.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you didn't add it previously.
2. In the *App_Data* folder, create a new a folder and name it *UploadedFiles*.
3. In the root, create a new file named *FileUpload.cshtml*.
4. Replace the default markup and code in the page with the following:

```
@{
    var fileName = "";
    if (IsPost) {
        var fileSavePath = "";
        var uploadedFile = Request.Files[0];
        fileName = Path.GetFileName(uploadedFile.FileName);
        fileSavePath = Server.MapPath("~/App_Data/UploadedFiles/" +
          fileName);
        uploadedFile.SaveAs(fileSavePath);
    }
}
```

```
<!DOCTYPE html>
<html>
    <head>
    <title>FileUpload - Single-File Example</title>
    </head>
    <body>
    <h1>FileUpload - Single-File Example</h1>
    @FileUpload.GetHtml(
        initialNumberOfFiles:1,
        allowMoreFilesToBeAdded:false,
        includeFormTag:true,
        uploadText:"Upload")
    @if (IsPost) {
        <span>File uploaded!</span><br/>
    }
    </body>
</html>
```

The body portion of the page uses the `FileUpload` helper to create the upload box and buttons that you're probably familiar with:

The properties that you set for the `FileUpload` helper specify that you want a single box for the file to upload and that you want the submit button to read **Upload**. (You'll add more boxes later in the chapter.)

When the user clicks **Upload**, the code at the top of the page gets the file and saves it. The `Request` object that you normally use to get values from form fields also has a `Files` array that contains the file (or files) that have been uploaded. You can get individual files out of specific positions in the array — for example, to get the first uploaded file, you get `Request.Files[0]`, to get the second file, you get `Request.Files[1]`, and so on. (Remember that in programming, counting usually starts at zero.)

When you fetch an uploaded file, you put it in a variable (here, `uploadedFile`) so that you can manipulate it. To determine the name of the uploaded file, you just get its `FileName` property. However, when the user uploads a file, `FileName` contains the user's original name, which includes the entire path. It might look like this:

C:\Users\Public\Sample.txt

You don't want all that path information, though, because that's the path on the user's computer, not for your server. You just want the actual file name (*Sample.txt*). You can strip out just the file from a path by using the `Path.GetFileName` method, like this:

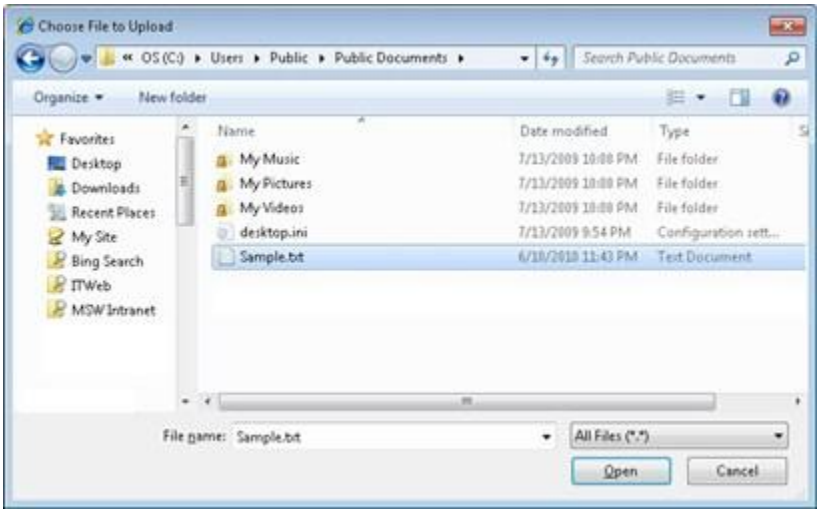
```
Path.GetFileName(uploadedFile.FileName)
```

The `Path` object is a utility that has a number of methods like this that you can use to strip paths, combine paths, and so on.

Once you've gotten the name of the uploaded file, you can build a new path for where you want to store the uploaded file in your website. In this case, you combine `Server.MapPath`, the folder names (*App_Data/UploadedFiles*), and the newly stripped file name to create a new path. You can then call the uploaded file's `SaveAs` method to actually save the file.

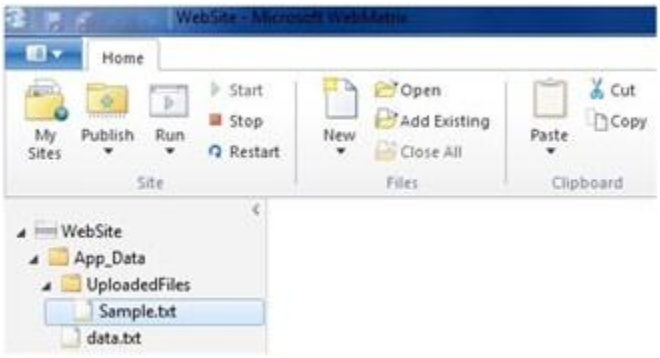
5. Run the page in a browser.

6. Click **Browse** and then select a file to upload.



The text box next to the **Browse** button will contain the path and file location.

7. Click **Upload**.
8. In the website, right-click the project folder and then click **Refresh**.
9. Open the *UploadedFiles* folder. The file that you uploaded is in the folder.



Letting Users Upload Multiple Files

In the previous example, you let users upload one file. But you can use the `FileUpload` helper to upload more than one file at a time. This is handy for scenarios like uploading photos, where uploading one file at a time is tedious. (You can read about uploading photos in Chapter 9 - Working with Images.) This example shows how to let users upload two at a time, although you can use the same technique to upload more than that.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already.
2. Create a new page named *FileUploadMultiple.cshtml*.
3. Replace the default markup and code in the page with the following:

```
@{
  var message = "";
  if (IsPost) {
      var fileName = "";
      var fileSavePath = "";
      int numFiles = Request.Files.Count;
      int uploadedCount = 0;
      for(int i =0; i < numFiles; i++) {
          var uploadedFile = Request.Files[i];
          if (uploadedFile.ContentLength > 0) {
              fileName = Path.GetFileName(uploadedFile.FileName);
              fileSavePath = Server.MapPath("~/App_Data/UploadedFiles/" +
                fileName);
              uploadedFile.SaveAs(fileSavePath);
              uploadedCount++;
          }
       }
       message = "File upload complete. Total files uploaded: " +
         uploadedCount.ToString();
   }
}
<!DOCTYPE html>
<html>
```

```
    <head><title>FileUpload - Multiple File Example</title></head>
<body>
    <form id="myForm" method="post"
       enctype="multipart/form-data"
       action="">
    <div>
    <h1>File Upload - Multiple-File Example</h1>
    @if (!IsPost) {
        @FileUpload.GetHtml(
            initialNumberOfFiles:2,
            allowMoreFilesToBeAdded:true,
            includeFormTag:true,
            addText:"Add another file",
            uploadText:"Upload")
        }
    <span>@message</span>
    </div>
    </form>
</body>
</html>
```

In this example, the `FileUpload` helper in the body of the page is configured to let users upload two files by default. Because `allowMoreFilesToBeAdded` is set to `true`, the helper renders a link that lets user add more upload boxes:

To process the files that the user uploads, the code uses the same basic technique that you used in the previous example — get a file from `Request.Files` and then save it. (Including the various things you need to do to get the right file name and path.) The innovation this time is that the user might be uploading multiple files and you don't know many. To find out, you can get `Request.Files.Count`.

With this number in hand, you can loop through `Request.Files`, fetch each file in turn, and save it. When you want to loop a known number of times through a collection, you can use a `for` loop, like this:

```
for(int i =0; i < numFiles; i++) {
    var uploadedFile = Request.Files[i];
    if (uploadedFile.ContentLength > 0) {
        fileName = Path.GetFileName(uploadedFile.FileName);

    // etc.
}
```

The variable `i` is just a temporary counter that will go from zero to whatever upper limit you set. In this case, the upper limit is the number of files. But because the counter starts at zero, as is typical for counting scenarios in ASP.NET, the upper limit is actually one less than the file count. (If three files are uploaded, the count is zero to 2.)

The `uploadedCount` variable totals all the files that are successfully uploaded and saved. This code accounts for the possibility that an expected file may not be able to be uploaded.

4. Run the page in a browser. The browser displays the page and its two upload boxes.
5. Select two files to upload.
6. Click **Add another file**. The page displays a new upload box.

7. Click **Upload**.
8. In the website, right-click the project folder and then click **Refresh**.
9. Open the *UploadedFiles* folder to see the successfully uploaded files.

Additional Resources

- Chapter 9 - Working with Images
- Exporting to a CSV File
- ASP.NET Web Pages with Razor Syntax Reference

Chapter 9 – Working with Images

This chapter shows you how to add, display, and manipulate images (resize, flip, and add watermarks) in your website.

What you'll learn

- How to add an image to a page dynamically.
- How to let users upload an image.
- How to resize an image.
- How to flip or rotate an image.
- How to add a watermark to an image.
- How to use an image as a watermark.

These are the ASP.NET programming features introduced in the chapter:

- The `WebImage` helper.
- The `Path` object, which provides methods that let you manipulate path and file names.

Adding an Image to a Web Page Dynamically

You can add images to your website and to individual pages while you're developing the website. You can also let users upload images, which might be useful for tasks like letting them add a profile photo.

If an image is already available on your site and you just want to display it on a page, you use an HTML `<img>` element like this:

```
<img src="images/Photo1.jpg" alt="Sample Photo" />
```

Sometimes, though, you need to be able to display images dynamically — that is, you don't know what image to display until the page is running.

The procedure in this section shows how to display an image on the fly where users specify the image file name from a list of image names. They select the name of the image from a drop-down list, and when they submit the page, the image they selected is displayed.

1. In WebMatrix, create a new website.
2. Add a new page named *DynamicImage.cshtml*.
3. In the root folder of the website, add a new folder and name it *images*.
4. Add four images to the *images* folder you just created. (Any images you have handy will do, but they should fit onto a page.) Rename the images *Photo1.jpg*, *Photo2.jpg*, *Photo3.jpg*, and *Photo4.jpg*. (You won't use *Photo4.jpg* in this procedure, but you'll use it later in the chapter.)
5. Verify that the four images are not marked as read-only.
6. Replace the existing markup in the page with the following:

```
@{  var imagePath= "";
    if( Request["photoChoice"] != null){
        imagePath = @"images\" + Request["photoChoice"];
   }
}
<!DOCTYPE html>
<html>
<head>
  <title>Display Image on the Fly</title>
</head>
<body>
<h1>Displaying an Image On the Fly</h1>
<form method="post" action="">
    <div>
        I want to see:
        <select name="photoChoice">
            <option value="Photo1.jpg">Photo 1</option>
            <option value="Photo2.jpg">Photo 2</option>
            <option value="Photo3.jpg">Photo 3</option>
        </select>
         
        <input type="submit" value="Submit" />
    </div>
    <div style="padding:10px;">
```

```
        @if(imagePath != ""){
            <img src="@imagePath" alt="Sample Image" width="300px" />
        }
    </div>
</form>
</body>
</html>
```

The body of the page has a drop-down list (a `<select>` element) that's named `photoChoice`. The list has three options, and the `value` attribute of each list option has the name of one of the images that you put in the *images* folder. Essentially, the list lets the user select a friendly name like "Photo 1", and it then passes the *.jpg* file name when the page is submitted.

In the code, you can get the user's selection (in other words, the image file name) from the list by reading `Request["photoChoice"]`. You first see if there's a selection at all. If there is, you construct a path for the image that consists of the name of the folder for the images and the user's image file name. (If you tried to construct a path but there was nothing in `Request["photoChoice"]`, you'd get an error.) This results in a relative path like this:

images/Photo1.jpg

The path is stored in variable named `imagePath` that you'll need later in the page.

In the body, there's also an `<img>` element that's used to display the image that the user picked. The `src` attribute isn't set to a file name or URL, like you'd do to display a static element. Instead, it's set to `@imagePath`, meaning that it gets its value from the path you set in code.

The first time that the page runs, though, there's no image to display, because the user hasn't selected anything. This would normally mean that the `src` attribute would be empty and the image would show up as a red "x" (or whatever the browser renders when it can't find an image). To prevent this, you put the `<img>` element in an `if` block that tests to see whether the `imagePath` variable has anything in it. If the user made a selection, `imagePath` contains the path. If the user didn't pick an image or if this is the first time the page is displayed, the `<img>` element isn't even rendered.

7. Save the file and run the page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.)

Uploading an Image

The previous example showed you how to display an image dynamically, but it worked only with images that were already on your website. This procedure shows how to let users upload an image, which is then displayed on the page. In ASP.NET, you can manipulate images on the fly using the `WebImage` helper, which has methods that let you create, manipulate, and save images. The `WebImage` helper supports all the common web image file types, including *.jpg*, *.png*, and *.bmp*. Throughout this chapter, you'll use *.jpg* images, but you can use any of the image types.

1. Add a new page and name it *UploadImage.cshtml*.
2. Replace the existing markup in the page with the following:

```
@{  WebImage photo = null;
    var newFileName = "";
    var imagePath = "";

    if(IsPost){
        photo = WebImage.GetImageFromRequest();
        if(photo != null){
            newFileName = Guid.NewGuid().ToString() + "_" +
                Path.GetFileName(photo.FileName);
            imagePath = @"images\" + newFileName;

            photo.Save(@"~\" + imagePath);
        }
    }
}
<!DOCTYPE html>
<html>
<head>
  <title>Image Upload</title>
</head>
<body>
  <form action="" method="post" enctype="multipart/form-data">
    <fieldset>
      <legend> Upload Image </legend>
      <label for="Image">Image</label>
      <input type="file" name="Image" />
      <br/>
      <input type="submit" value="Upload" />
    </fieldset>
  </form>
  <h1>Uploaded Image</h1>
```

```
    @if(imagePath != ""){
    <div class="result">
        <img src="@imagePath" alt="image" />

    </div>
    }
</body>
</html>
```

The body of the text has an `<input type="file">` element, which lets users select a file to upload. When they click **Submit**, the file they picked is submitted along with the form.

To get the uploaded image, you use the `WebImage` helper, which has all sorts of useful methods for working with images. Specifically, you use `WebImage.GetImageFromRequest` to get the uploaded image (if any) and store it in a variable named `photo`.

A lot of the work in this example involves getting and setting file and path names. The issue is that you want to get the name (and just the name) of the image that the user uploaded, and then create a new path for where you're going to store the image. Because users could potentially upload multiple images that have the same name, you use a bit of extra code to create unique names and make sure that users don't overwrite existing pictures.

If an image actually has been uploaded (the test `if (photo != null)`), you get the image name from the image's `FileName` property. When the user uploads the image, `FileName` contains the user's original name, which includes the path from the user's computer. It might look like this:

C:\Users\Joe\Pictures\SamplePhoto1.jpg

You don't want all that path information, though — you just want the actual file name (*SamplePhoto1.jpg*). You can strip out just the file from a path by using the `Path.GetFileName` method, like this:

```
Path.GetFileName(photo.FileName)
```

You then create a new unique file name by adding a GUID to the original name. (For more about GUIDs, see About GUIDs later in this chapter.) Then you construct a complete path that you can use to save the image. The save path is made up of the new file name, the folder (images), and the current website location.

> **Note** In order for your code to save files in the *images* folder, the application needs read-write permissions for that folder. On your development computer this is not typically an issue. However, when you publish your site to a hosting provider's web server, you might need to explicitly set those permissions. If you run this code on a hosting provider's server and get errors, check with the hosting provider to find out how to set those permissions.

Finally, you pass the save path to the `Save` method of the `WebImage` helper. This stores the uploaded image under its new name. The save method looks like this: `photo.Save(@"~\" +`

`imagePath`). The complete path is appended to `@"~\"`, which is the current website location. (For information about the ~ operator, see Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax.)

As in the previous example, the body of the page contains an `<img>` element to display the image. If `imagePath` has been set, the `<img>` element is rendered and its `src` attribute is set to the `imagePath` value.

3. Run the page in a browser.

About GUIDs

A GUID (globally-unique ID) is an identifier that looks something like this: `936DA01F-9ABD-4d9d-80C7-02AF85C822A8`. (Technically, it's a 16-byte/128-bit number.) When you need a GUID, you can call specialized code that generates a GUID for you. The idea behind GUIDs is that between the enormous size of the number (3.4×10^{38}) and the algorithm for generating it, the resulting number is virtually guaranteed to be one of a kind. GUIDs therefore are a good way to generate names for things when you must guarantee that you won't use the same name twice. The downside, of course, is that GUIDs aren't particularly user friendly, so they tend to be used when the name is used only in code.

Resizing an Image

If your website accepts images from a user, you might want to resize the images before you display or save them. You can again use the `WebImage` helper for this.

This procedure shows how to resize an uploaded image to create a thumbnail and then save the thumbnail and original image in the website. You display the thumbnail on the page and use a hyperlink to redirect users to the full-sized image.

1. Add a new page named *Thumbnail.cshtml*.
2. In the *images* folder, create a subfolder named *thumbs*.
3. Replace the existing markup in the page with the following:

```
@{  WebImage photo = null;
    var newFileName = "";
    var imagePath = "";
    var imageThumbPath  = "";

    if(IsPost){
        photo = WebImage.GetImageFromRequest();
        if(photo != null){
             newFileName = Guid.NewGuid().ToString() + "_" +
                 Path.GetFileName(photo.FileName);
             imagePath = @"images\" + newFileName;
             photo.Save(@"~\" + imagePath);

            imageThumbPath = @"images\thumbs\" + newFileName;
            photo.Resize(width: 60, height: 60, preserveAspectRatio: true,
               preventEnlarge: true);
            photo.Save(@"~\" + imageThumbPath);        }
    }
}
<!DOCTYPE html>
<html>
<head>
  <title>Resizing Image</title>
</head>
<body>
<h1>Thumbnail Image</h1>
  <form action="" method="post" enctype="multipart/form-data">
    <fieldset>
      <legend> Creating Thumbnail Image </legend>
      <label for="Image">Image</label>
      <input type="file" name="Image" />
      <br/>
      <input type="submit" value="Submit" />
    </fieldset>
  </form>
    @if(imagePath != ""){
    <div class="result">
        <img src="@imageThumbPath" alt="Thumbnail image" />
        <a href="@Html.AttributeEncode(imagePath)" target="_Self">
            View full size
        </a>
    </div>

    }
</body>
</html>
```

This code is similar to the code from the previous example. The difference is that this code saves the image twice, once normally and once after you create a thumbnail copy of the image. First you get the uploaded image and save it in the *images* folder. You then construct a new path for the thumbnail image. To actually create the thumbnail, you call the `WebImage` helper's `Resize` method to create a 60-pixel by 60-pixel image. The example shows how you preserve the aspect

ratio and how you can prevent the image from being enlarged (in case the new size would actually make the image larger). The resized image is then saved in the *thumbs* subfolder.

At the end of the markup, you use the same `<img>` element with the dynamic `src` attribute that you've seen in the previous examples to conditionally show the image. In this case, you display the thumbnail. You also use an `<a>` element to create a hyperlink to the big version of the image. As with the `src` attribute of the `<img>` element, you set the `href` attribute of the `<a>` element dynamically to whatever is in `imagePath`. To make sure that the path can work as a URL, you pass `imagePath` to the `Html.AttributeEncode` method, which converts reserved characters in the path to characters that are ok in a URL.

4. Run the page in a browser.

Rotating and Flipping an Image

The `WebImage` helper also lets you flip and rotate images. This procedure shows how to get an image from the server, flip the image upside down (vertically), save it, and then display the flipped image on the page. In this example, you're just using a file you already have on the server (*Photo2.jpg*). In a real application, you'd probably flip an image whose name you get dynamically, like you did in previous examples.

1. Add a new page named *Flip.cshtml*.
2. Replace the existing markup in the file with the following:

```
@{  var imagePath= "";
    WebImage photo = new WebImage(@"~\Images\Photo2.jpg");
    if(photo != null){
        imagePath = @"images\Photo2.jpg";
        photo.FlipVertical();
        photo.Save(@"~\" + imagePath);
     }
}
```

```
<!DOCTYPE html>
<html>
<head>
  <title>Get Image From File</title>
  <meta http-equiv="content-type" content="text/html;charset=utf-8" />
</head>
<body>
<h1>Flip Image Vertically</h1>
@if(imagePath != ""){
  <div class="result">
    <img src="@imagePath" alt="Image" />
  </div>
}
</body>
</html>
```

The code uses the `WebImage` helper to get an image from the server. You create the path to the image using the same technique you used in earlier examples for saving images, and you pass that path when you create an image using `WebImage`:

```
WebImage photo = new WebImage(@"~\Images\Photo2.jpg");
```

If an image is found, you construct a new path and file name, like you did in earlier examples. To flip the image, you call the `FlipVertical` method, and then you save the image again.

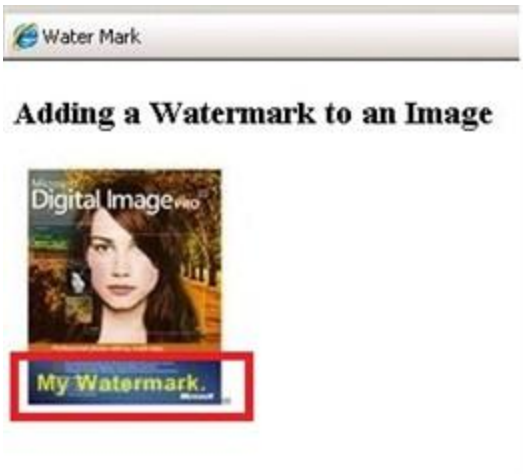
The image is again displayed on the page by using the `<img>` element with the `src` attribute set to `imagePath`.

3. Run the page in a browser. The image for *Photo2.jpg* is shown upside down. If you request the page again, the image is flipped right side up again.

To rotate an image, you use the same code, except that instead of calling the `FlipVertical` or `FlipHorizontal`, you call `RotateLeft` or `RotateRight`.

Adding a Watermark to an Image

When you add images to your website, you might want to add a watermark to the image before you save it or display it on a page. People often use watermarks to add copyright information to an image or to advertise their business name.



1. Add a new page named *Watermark.cshtml*.
2. Replace the existing markup with the following:

```
@{  var imagePath= "";
    WebImage photo = new WebImage(@"~\Images\Photo3.jpg");
    if(photo != null){
        imagePath = @"images\Photo3.jpg";
        photo.AddTextWatermark("My Watermark", fontColor:"Yellow", fontFamily:
            "Arial");
        photo.Save(@"~\" + imagePath);    }
}
<!DOCTYPE html>
<html>
<head>
  <title>Water Mark</title>
  <meta http-equiv="content-type" content="text/html;charset=utf-8" />
</head>
<body>
<h1>Adding a Watermark to an Image</h1>
@if(imagePath != ""){
  <div class="result">
    <img src="@imagePath" alt="Image" />
  </div>
}
</body>
</html>
```

This code is like the code in the *Flip.cshtml* page from earlier (although this time it uses the *Photo3.jpg* file). To add the watermark, you call the `WebImage` helper's `AddTextWatermark` method before you save the image. In the call to `AddTextWatermark`, you pass the text "My Watermark", set the font color to yellow, and set the font family to Arial. (Although it's not shown here, the `WebImage` helper also lets you specify opacity, font family and font size, and the position of the watermark text.) When you save the image it must not be read-only.

As you've seen before, the image is displayed on the page by using the `<img>` element with the `src` attribute set to `@imagePath`.

3. Run the page in a browser.

Using an Image As a Watermark

Instead of using text for a watermark, you can use another image. People sometimes use images like a company logo as a watermark, or they use a watermark image instead of text for copyright information.

1. Add a new page named *ImageWatermark.cshtml*.
2. Add an image to the *images* folder that you can use as a logo, and rename the image *MyCompanyLogo.jpg*. This image should be an image that you can see clearly when it's set to 80 pixels wide and 20 pixels high.
3. Replace the existing markup with the following:

```
@{  var imagePath = "";
   WebImage WatermarkPhoto = new WebImage(@"~\" +
        @"\Images\MyCompanyLogo.jpg");
    WebImage photo = new WebImage(@"~\Images\Photo4.jpg");
    if(photo != null){
        imagePath = @"images\Photo4.jpg";
        photo.AddImageWatermark(WatermarkPhoto, width: 80, height: 20,
           horizontalAlign:"Center", verticalAlign:"Bottom",
           opacity:100,  padding:10);
      photo.Save(@"~\" + imagePath);
   }
}
<!DOCTYPE html>
<html>
<head>
  <title>Image Watermark</title>
  <meta http-equiv="content-type" content="text/html;charset=utf-8" />
</head>
<body>
  <h1>Using an Image as a Watermark</h1>
  @if(imagePath != ""){
    <div class="result">
      <img src="@imagePath" alt="Image" />
    </div>
```

```
  }
</body>
</html>
```

This is another variation on the code from earlier examples. In this case, you call `AddImageWatermark` to add the watermark image to the target image (*Photo3.jpg*) before you save the image. When you call `AddImageWatermark`, you set its width to 80 pixels and the height to 20 pixels. The *MyCompanyLogo.jpg* image is horizontally aligned in the center and vertically aligned at the bottom of the target image. The opacity is set to 100% and the padding is set to 10 pixels. If the watermark image is bigger than the target image, nothing will happen. If the watermark image is bigger than the target image and you set the padding for the image watermark to zero, the watermark is ignored.

As before, you display the image using the `<img>` element and a dynamic `src` attribute.

4. Run the page in a browser.

Additional Resources

- Chapter 8 - Working with Files
- ASP.NET Web Pages with Razor Syntax Reference

Chapter 10 – Working with Video

This chapter explains how to display video in an ASP.NET Web Pages with Razor syntax page.

ASP.NET Web Pages with Razor syntax lets you play Flash (*.swf*), Media Player (*.wmv*), and Silverlight (*.xap*) videos.

What you'll learn

- How to choose a video player.
- How to add video to a web page.
- How to set video player attributes.

These are the ASP.NET Razor pages features introduced in the chapter:

- The `Video` helper.

Choosing a Video Player

There are lots of formats for video files, and each format typically requires a different player and a different way to configure the player. In ASP.NET Razor pages, you can play a video in a web page using the `Video` helper. The `Video` helper simplifies the process of embedding videos in a web page because it automatically generates the `object` and `embed` HTML elements that are normally used to add video to the page.

The `Video` helper supports the following media players:

- Adobe Flash
- Windows Media Player
- Microsoft Silverlight

The Flash Player

The `Flash` player of the `Video` helper let you play Flash videos (*.swf* files) in a web page. At a minimum, you have to provide a path to the video file. If you specify nothing but the path, the player uses default values that are set by the current version of Flash. Typical default settings are:

- The video is displayed using its default width and height and without a background color.
- The video plays automatically when the page loads.
- The video loops continuously until it's explicitly stopped.
- The video is scaled to show all of the video, rather than cropping the video to fit a specific size.
- The video plays in a window.

The MediaPlayer Player

The `MediaPlayer` player of the `Video` helper lets you play Windows Media videos (*.wmv* files), Windows Media audio (*.wma* files), and MP3 (*.mp3* files) in a web page. You must include path of the media file to play; all other parameters are optional. If you specify only a path, the player uses default settings set by the current version of MediaPlayer, such as:

- The video is displayed using its default width and height.
- The video plays automatically when the page loads.
- The video plays once (it doesn't loop).
- The player displays the full set of controls in the user interface.
- The video plays in in a window.

The Silverlight Player

The `Silverlight` player of the `Video` helper lets you play Windows Media Video (*.wmv* files), Windows Media Audio (*.wma* files), and MP3 (*.mp3* files). You must set the path parameter to point to a Silverlight-based application package (*.xap* file). You also must set the width and height parameters. All other parameters are optional. When you use the Silverlight player for video, if you set only the required parameters, the Silverlight player displays the video without a background color.

> **Note** In case you don't already know Silverlight: the *.xap* file is a compressed file that contains layout instructions in a *.xaml* file, managed code in assemblies, and optional resources. You can create a *.xap* file in Visual Studio as a Silverlight application project.

The `Silverlight` video player uses both the settings that you provide for the player and the settings that are provided in the *.xap* file.

MIME Types

When a browser downloads a file, the browser makes sure that the file type matches the MIME type that's specified for the document that's being rendered. The MIME type is the content type or media type of a file. The `Video` helper uses the following MIME types:

```
application/x-shockwave-flash
application/x-mplayer2
application/x-silverlight-2
```

Playing Flash (.swf) Videos

This procedure shows you how to play a Flash video named *sample.swf*. The procedure assumes that you've got a folder named *Media* on your site and that the *.swf* file is in that folder.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already added it.
2. In the website, add a page and name it *FlashVideo.cshtml*.
3. Add the following markup to the page:

```
<!DOCTYPE html>
<html>
<head>
    <title>Flash Video</title>
</head>
<body>
    @Video.Flash(path: "Media/sample.swf",
                 width: "400",
                 height: "600",
                 play: true,
                 loop: true,
                 menu:  false,
                 bgColor: "red",
                 quality: "medium",
                 scale: "exactfit",
                 windowMode: "transparent")
</body>
</html>
```

4. Run the page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.) The page is displayed and the video plays automatically.

You can set the `quality` parameter for a Flash video to `low`, `autolow`, `autohigh`, `medium`, `high`, and `best`:

```
<!-- Set the Flash video quality -->
@Video.Flash(path: "Media/sample.swf", quality: "autohigh")
```

You can change the Flash video to play at a specific size using the `scale` parameter, which you can set to the following:

- `showall`. This makes the entire video visible while maintaining the original aspect ratio. However, you might end up with borders on each side.
- `noorder`. This scales the video while maintaining the original aspect ratio, but it might be cropped.
- `exactfit`. This makes the entire video visible without preserving the original aspect ratio, but distortion may occur.

If you don't specify a `scale` parameter, the entire video will be visible and the original aspect ratio will be maintained without any cropping. The following example shows how to use the `scale` parameter:

```
<!-- Set the Flash video to an exact size -->
@Video.Flash(path: "Media/sample.swf", width: "1000", height: "100",
    scale: "exactfit")
```

The Flash player supports a video mode setting named `windowMode`. You can set this to `window`, `opaque`, and `transparent`. By default, the `windowMode` is set to `window`, which displays the video in a separate window on the web page. The `opaque` setting hides everything behind the video on the web page. The `transparent` setting lets the background of the web page show through the video, assuming any part of the video is transparent.

Playing MediaPlayer (*.wmv*) Videos

The following procedure shows you how to play a Window Media video named *sample.wmv* that's in the *Media* folder.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1, if you haven't already.
2. Create a new page named *MediaPlayerVideo.cshtml*.
3. Add the following markup to the page:

```
<!DOCTYPE html>
<html>
<head>
  <title>MediaPlayer Video</title>
</head>
<body>
    @Video.MediaPlayer(
        path: "Media/sample.wmv",
        width: "400",
        height: "600",
        autoStart: true,
        playCount: 2,
        uiMode:  "full",
        stretchToFit: true,
        enableContextMenu: true,
        mute: false,
        volume: 75)
</body>
</html>
```

4. Run the page in a browser. The video loads and plays automatically.

You can set `playCount` to an integer that indicates how many times to play the video automatically:

```
<!-- Set the MediaPlayer video playCount -->
@Video.MediaPlayer(path: "Media/sample.wmv", playCount: 2)
```

The `uiMode` parameter lets you specify which controls show up in the user interface. You can set `uiMode` to `invisible`, `none`, `mini`, or `full`. If you don't specify a `uiMode` parameter, the video will be displayed with the status window, seek bar, control buttons, and volume controls in addition to the video window. These controls will also be displayed if you use the player to play an audio file. Here's an example of how to use the `uiMode` parameter:

```
<!-- Set the MediaPlayer control UI -->
@Video.MediaPlayer(path: "Media/sample.wmv", uiMode: "mini")
```

By default, audio is on when the video plays. You can mute the audio by setting the `mute` parameter to true:

```
<!-- Play the MediaPlayer video without audio -->
@Video.MediaPlayer(path: "Media/sample.wmv", mute: true)
```

You can control the audio level of the MediaPlayer video by setting the `volume` parameter to a value between 0 and 100. The default value is 50. Here's an example:

```
<!-- Play the MediaPlayer video without audio -->
@Video.MediaPlayer(path: "Media/sample.wmv", volume: 75)
```

Playing Silverlight Videos

This procedure shows you how to play video contained in a Silverlight *.xap* page that's in a folder named *Media*.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1, if you haven't already .
2. Create a new page named *SilverlightVideo.cshtml*.
3. Add the following markup to the page:

```
<!DOCTYPE html>
<html>
<head>
  <title>Silverlight Video</title>
</head>
<body>
    @Video.Silverlight(
        path: "Media/sample.xap",
        width: "400",
        height: "600",
        bgColor: "red",
        autoUpgrade: true)
</body>
</html>
```

4. Run the page in a browser.

Additional Resources

- Silverlight Overview
- Flash OBJECT and EMBED tag attributes
- Windows Media Player 11 SDK PARAM Tags
- ASP.NET Web Pages with Razor Syntax Reference

Chapter 11 – Adding Email to Your Website

This chapter explains how to send an automated email message from a website.

What you'll learn

- How to send an email message from your website.
- How to attach a file to an email message.

This is the ASP.NET feature introduced in the chapter:

- The `WebMail` helper.

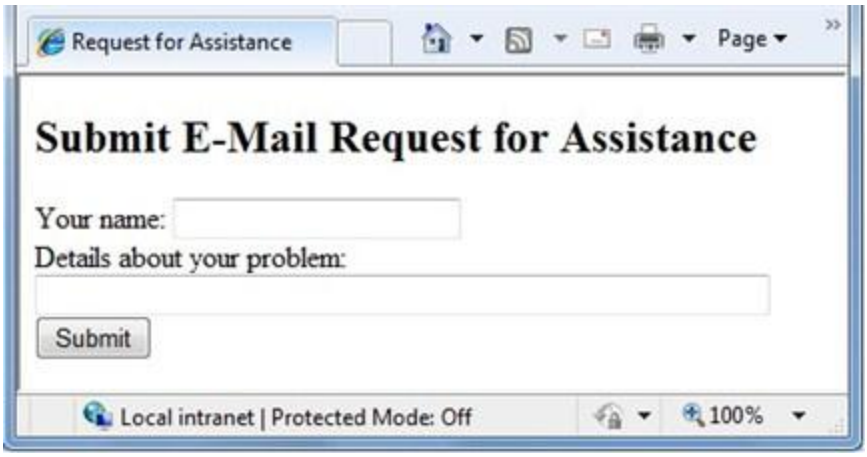
Sending Email Messages from Your Website

There are all sorts of reasons why you might need to send email from your website. You might send confirmation messages to users, or you might send notifications to yourself (for example, that a new user has registered.) The `WebMail` helper makes it easy for you to send email.

To use the `WebMail` helper, you have to have access to an SMTP server. (SMTP stands for Simple Mail Transfer Protocol.) An SMTP server is an email server that only forwards messages to the recipient's server — it's the outbound side of email. If you use a hosting provider for your website, they probably set you up with email and they can tell you what your SMTP server name is. If you're working inside a corporate network, an administrator or your IT department can usually give you the information about an SMTP server that you can use. If you're working at home, you might even be able to test using your ordinary email provider, who can tell you the name of their SMTP server. You typically need:

- The name of the SMTP server.ga
- The port number. (This is almost always 25. However, your ISP may require you to use port 587.)
- Credentials (user name, password).

In this procedure, you create two pages. The first page has a form that lets users enter a description, as if they were filling in a technical-support form. The first page submits its information to a second page. In the second page, code extracts the user's information and sends an email message. It also displays a message confirming that the problem report has been received.



Note To keep this example simple, the code initializes the `WebMail` helper right in the page where you use it. However, for real websites, it's a better idea to put initialization code like this in a global file, so that you initialize the `WebMail` helper for all files in your website. For more information, see Chapter 18 - Customizing Site-Wide Behavior.

1. Create a new website.
2. Add a new page named *EmailRequest.cshtml* and add the following markup:

```
<!DOCTYPE html>
<html>
<head>
    <title>Request for Assistance</title>
</head>
<body>
  <h2>Submit Email Request for Assistance</h2>
  <form method="post" action="ProcessRequest.cshtml">
    <div>
        Your name:
        <input type="text" name="customerName" />
    </div>

    <div>
        Details about your problem: <br />
        <textarea name="customerRequest" cols="45" rows="4"></textarea>
    </div>

    <div>
        <input type="submit" value="Submit" />
    </div>
  </form>
</body>
</html>
```

Notice that the `action` attribute of the form element has been set to *ProcessRequest.cshtml*. This means that the form will be submitted to that page instead of back to the current page.

3. Add a new page named *ProcessRequest.cshtml* to the website and add the following code and markup:

```
@{
    var customerName = Request["customerName"];
    var customerRequest = Request["customerRequest"];
    try {
        // Initialize WebMail helper
        WebMail.SmtpServer = "your-SMTP-host";
        WebMail.SmtpPort = 25;
        WebMail.EnableSsl = true;
        WebMail.UserName = "your-user-name-here";
        WebMail.From = "your-email-address-here";
        WebMail.Password = "your-account-password";

        // Send email
        WebMail.Send(to: "target-email-address-here",
            subject: "Help request from - " + customerName,
            body: customerRequest
        );
    }
    catch (Exception ex ) {
        <text>
            <b>The email was <em>not</em> sent.</b>
            The code in the ProcessRequest page must provide an
            SMTP server name, a user name, a password, and
            a "from" address.
        </text>
    }
}
<!DOCTYPE html>
<html>
<head>
  <title>Request for Assistance</title>
</head>
<body>
  <p>Sorry to hear that you are having trouble, <b>@customerName</b>.</p>

  <p>An email message has been sent to our customer service
     department regarding the following problem:</p>

  <p><b>@customerRequest</b></p>
</body>
</html>
```

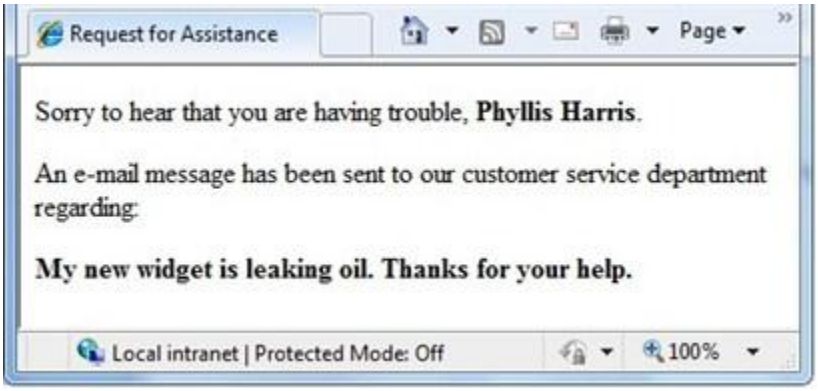
In the code, you get the values of the form fields that were submitted to the page. You then call the `WebMail` helper's `Send` method to create and send the email message. In this case, the values to use are made up of text that you concatenate with the values that were submitted from the form.

The code for this page is inside a `try/catch` block. If for any reason the attempt to send an email doesn't work (for example, the settings aren't right), the page displays a message. The `<text>` tag is used to mark multiple lines of text within a code block. (For more information about `try/catch` blocks or the `<text>` tag, see Chapter2 - Introduction to ASP.NET Web Programming Using the Razor Syntax.)

4. Modify the following email related settings in the code:

    - Set `your-SMTP-host` to the name of the SMTP server that you have access to.
    - Set `your-user-name-here` to the user name for your SMTP server account.
    - Set `your-email-address-here` to your own email address. This is the email address that the message is sent from.
    - Set `your-account-password` to the password for your SMTP server account.
    - Set `target-email-address-here` to the email address of the person you want to send the message to. Normally this would be the email address of the recipient. For testing, though, you want the message to be sent to you. Therefore, set this to your own email address. When the page runs, you'll receive the message.

5. Run the *EmailRequest.cshtml* page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.)
6. Enter your name and a problem description, and then click the **Submit** button. You're redirected to the *ProcessRequest.cshtml* page, which confirms your message and which sends you an email message.



Sending a File Using Email

You can also send files that are attached to email messages. In this procedure, you create a text file and two HTML pages. You'll use the text file as an email attachment.

1. In the website, add a new text file and name it *MyFile.txt*.
2. Copy the following text and paste it in the file:

```
Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor
incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud
exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat.
```

3. Create a page named *SendFile.cshtml* and add the following markup:

```
<!DOCTYPE html>
<html>
<head>
```

```
    <title>Attach File</title>
</head>
<body>
  <h2>Submit Email with Attachment</h2>
  <form method="post" action="ProcessFile.cshtml">
    <div>
        Your name:
        <input type="text" name="customerName" />
    </div>

    <div>
        Subject line: <br />
        <input type="text" size= 30 name="subjectLine" />
    </div>

    <div>
        File to attach: <br />
        <input type="text" size=60 name="fileAttachment" />
    </div>

    <div>
        <input type="submit" value="Submit" />
    </div>
  </form>
</body>
</html>
```

4. Create a page named *ProcessFile.cshtml* and add the following markup:

```
@{
    var customerName = Request["customerName"];
    var subjectLine = Request["subjectLine"];
    var fileAttachment = Request["fileAttachment"];

    try {
        // Initialize WebMail helper
        WebMail.SmtpServer = "your-SMTP-host";
        WebMail.SmtpPort = 25;
        WebMail.EnableSsl = true;
        WebMail.UserName = "your-user-name-here";
        WebMail.From = "your-email-address-here";
        WebMail.Password = "your-account-password";

        // Create array containing file name
        var filesList = new string [] { fileAttachment };

        // Attach file and send email
        WebMail.Send(to: "target-email-address-here",
            subject: subjectLine,
            body: "File attached. <br />From: " + customerName,
            filesToAttach: filesList);
    }
    catch (Exception ex) {
        <text>
            <b>The email was <em>not</em> sent.</b>
            The code in the ProcessFile page must provide an
            SMTP server name, a user name, a password, and
            a "from" address.
```

```
        </text>
    }
}
<!DOCTYPE html>
<html>
<head>
    <title>Request for Assistance </title>
</head>
<body>
  <p><b>@customerName</b>, thank you for your interest.</p>

  <p>An email message has been sent to our customer service
  department with the <b>@fileAttachment</b> file attached.</p>

</body>
</html>
```

5. Modify the following email related settings in the code from the example:

    - Set `your-SMTP-host` to the name of an SMTP server that you have access to.
    - Set `your-user-name-here` to the user name for your SMTP server account.
    - Set `your-email-address-here` to your own email address. This is the email address that the message is sent from.
    - Set `your-account-password` to the password for your SMTP server account.
    - Set `target-email-address-here` to your own email address. (As before, you'd normally send an email to someone else, but for testing, you can send it to yourself.)

6. Run the *SendFile.cshtml* page in a browser.
7. Enter your name, a subject line, and the name of the text file to attach (*MyFile.txt*).
8. Click the `Submit` button. As before, you're redirected to the *ProcessFile.cshtml* page, which confirms your message and which sends you an email message with the attached file.

Additional Resources

- Chapter 18 - Customizing Site-Wide Behavior
- Simple Mail Transfer Protocol
- ASP.NET Web Pages with Razor Syntax Reference

Chapter 12 – Adding Search to Your Website

This chapter explains how to add the ability to search a website using the Bing search engine.

What you'll learn:

- How to add the ability to search a website (including your own) to your website.

This is the ASP.NET feature introduced in the chapter:

- The `Bing` helper.

Searching from Your Website

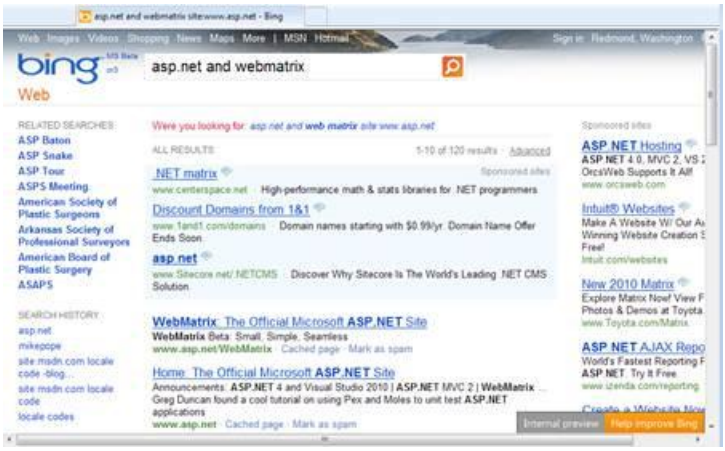
By adding the capability to search the web from your website, you can include Internet search results without leaving your site. Adding search to your site can be useful in these ways:

- Add a "Search this site" box that lets users search your site (that is, the current site). This makes it easy for users to find content on your site.
- Add a box that lets users easily search related sites. For example, if your site is for a school sports team, you could add a search box that lets users also search the school's website.
- Add a box that lets users search the web, but without having to leave your site to launch a search in another window.

To add search to your site, you use the `Bing` helper and (optionally) specify the URL of the site to search. The `Bing` helper renders a text box where users can enter a search term.

The `Bing` helper renders a box that includes the Bing search icon that users can click in order to launch the search:

If you've specified a site to search, the helper also renders radio buttons that let the user specify whether to search only the specified site or the web in general. When the user submits the search, the helper redirects the search to the Bing site (http://bing.com). The results are displayed in a new browser window, as if the user had entered the search term in the Bing home page:



In this procedure, you create a web page that shows how to use the `Bing` search helper which displays a custom search title and that can search the www.asp.net site.

1. Create a new website.
2. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already added it.
3. Add a new page named *Search.cshtml* and add the following markup:

```
@{
    Bing.SiteUrl = "www.asp.net";
    Bing.SiteTitle = "ASP.NET Custom Search";
}
<!DOCTYPE html>
<html>
    <head>
        <title>Bing Search Box</title>
    </head>
    <body>

    <div>
       <h1>Bing Search</h1>
       <p>Search displays results by opening a new browser window that shows the Bing
home page with search results.</p>
       Search the ASP.NET site: <br/>
       @Bing.SearchBox()
    </div>
    </body>
</html>
```

   In the code, you call the `Bing` helper. The `SearchBox` method uses the the optional `siteUrl` parameter, which lets you specify which site to search. (If you don't specify a URL, Bing just searches the web.) In this case, you're searching the www.asp.net website. If you wanted to search your own site, you'd substitute that URL for `www.asp.net`.

4. Run the *Search.cshtml* page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.)

5. Enter a search term in the box, and then click the  button. The results are displayed in a new browser window.

> **Note** In order for the `Bing` helper to return results, the site you're searching must be publicly available and its contents must have been examined ("crawled") by Bing. If you add a "Search this site" box and configure the `Bing` helper to search your own site, you won't be able to test it until the site has been live long enough for search engines to have found it. In other words, you won't be able to test the search capability in WebMatrix directly.

Additional Resources

- Make your Website SEO friendly
- Locale ID (LCID) Chart
- ASP.NET Web Pages with Razor Syntax Reference
- Bing API documentation
- Bing Box documentation

Chapter 13 – Adding Social Networking to Your Web Site

This chapter explains how to integrate your site with social networking services.

In this chapter, you'll learn how to let people bookmark/link your website on sites like Facebook or Digg, to add Twitter feeds to your site, and to dress up your site with Gravatar images and Xbox gamer cards.

What you'll learn

- How to let people bookmark/link your site.
- How to add a Twitter feed.
- How to render Gravatar.com images.
- How to display an Xbox gamer card on your site.
- How to add a Facebook **Like** button to pages.

These are the ASP.NET programming concepts introduced in the chapter:

- The `LinkShare` helper.
- The `Twitter` helper.
- The `Gravatar` helper.
- The `GamerCard` helper.
- The `Facebook` helper.

Linking Your Website on Social Networking Sites

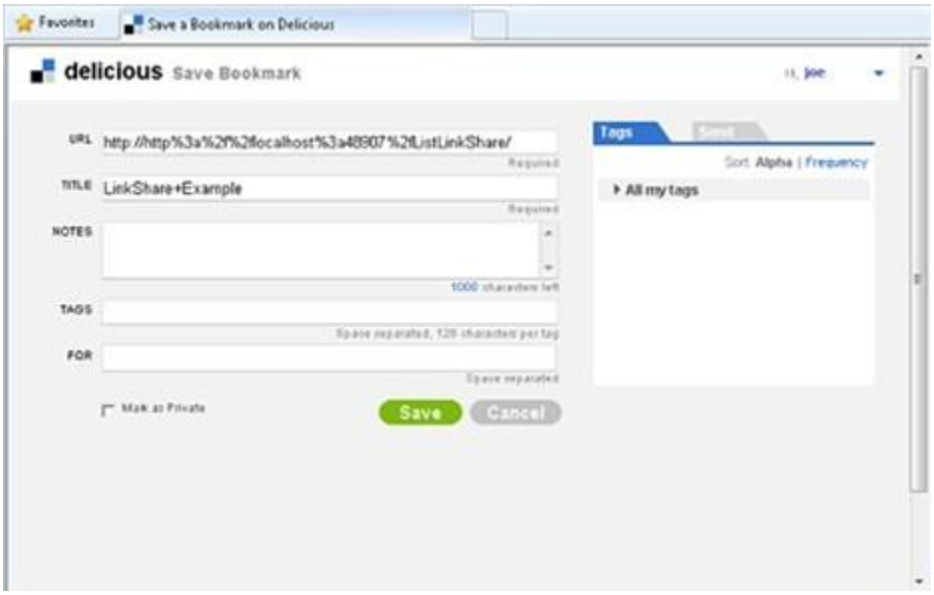
If people like something on your site, they often want to share it with friends. You can make this easy by displaying glyphs (icons) that people can click to share a page on Digg, Reddit, Facebook, Twitter, or similar sites. To display these glyphs, add the `LinkShare` helper to a page. People who visit your page can click an individual glyph. If they have an account with that social networking site, they can then post a link to your page on that site.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already added it.
2. Create a page named *ListLinkShare.cshtml* and add the following markup:

```
<!DOCTYPE html>
<html>
  <head>
    <title>LinkShare Example</title>
  </head>
  <body>
    <h1>LinkShare Example</h1>
    Share: @LinkShare.GetHtml("LinkShare Example")
  </body>
</html>
```

   In this example, when the `LinkShare` helper runs, the page title is passed as a parameter, which in turn passes the page title to the social networking site. However, you could pass in any string you want.

3. Run the *ListLinkShare.cshtml* page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.)
4. Click a glyph for one of the sites that you're signed up for. The link takes you to the page on the selected social network site where you can share a link. For example, if you click the `del.icio.us` link, you're taken to the `Save Bookmark` page on the Delicious website.



Adding a Twitter Feed

ASP.NET provides helpers that let you add a Twitter feed on a page. If you use the `Twitter.Profile` method in your code, you can display the Twitter feed for a specific Twitter user on your web page. If you use the `Twitter.Search` method in your code, you can specify a Twitter search (for words, hash tags,

or any other searchable text) and display the results on your page. Both helpers also let you configure settings like width, height, and styles.

Access to Twitter information is public, so you don't need a Twitter account in order to use the Twitter helpers on your pages.

The following procedure shows you how to create a web page that demonstrates both Twitter helpers.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1, if you haven't already.
2. Add a new page named *Twitter.cshtml* to the website.
3. Add the following code and markup to the page:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Twitter Example</title>
  </head>
  <body>
    <table>
      <tr>
        <td>Twitter profile helper</td>
        <td>Twitter search helper</td>
      </tr>
      <tr>
        <td>@Twitter.Profile("<Insert User Name>")</td>
        <td>@Twitter.Search("<Insert search criteria here>")</td>
      </tr>
    </table>
```

```
  </body>
</html>
```

4. In the `Twitter.Profile` code statement, replace `<Insert User Name>` with the account name of the feed you want to display.
5. In the `Twitter.Search` code statement, replace `<Insert search criteria here>` with the text you want to search for.
6. Run the page in a browser.

Rendering a Gravatar Image

A *Gravatar* (a "globally recognized avatar") is an image that can be used on multiple websites as your avatar — that is, an image that represents you. For example, a Gravatar can identify a person in a forum post, in a blog comment, and so on. (You can register your own Gravatar at the Gravatar website at http://www.gravatar.com/.) If you want to display images next to people's names or email addresses on your website, you can use the Gravatar helper.

In this example, you're using a single Gravatar that represents yourself. Another way to use Gravatars is to let people specify their Gravatar address when they register on your site. (You can learn how to let people register in Chapter 16 - Adding Security and Membership.) Then whenever you display information for that user, you can just add the Gravatar to where you display the user's name.

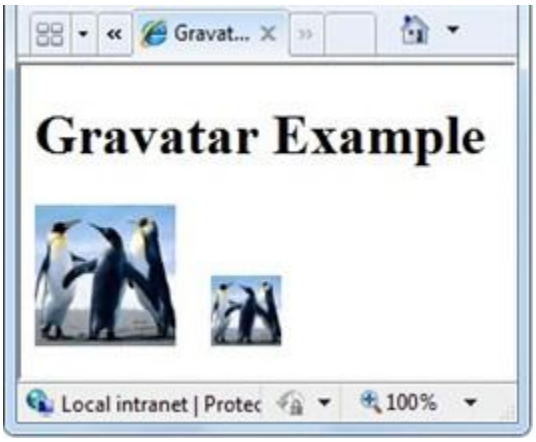
1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already.
2. Create a new web page named *Gravatar.cshtml*.
3. Add the following markup to the file:

```
<!DOCTYPE html>
<html>
    <head>
        <title>Gravatar Example</title>
    </head>
    <body>
        <h1>Gravatar Example</h1>
        @Gravatar.GetHtml("<Your Gravatar account here>")
           
        @Gravatar.GetHtml("<Your Gravatar account here>", 40)
    </body>
</html>
```

   The `Gravatar.GetHtml` method displays the Gravatar image on the page. To change the size of the image, you can include a number as a second parameter. The default size is 80. Numbers less than 80 make the image smaller. Numbers greater than 80 make the image larger.

4. In the `Gravatar.GetHtml` methods, replace `<Your Gravatar account here>` with the email address that you use for your Gravatar account. (If you don't have a Gravatar account, you can use the email address of someone who does.)

5. Run the page in your browser. The page displays two Gravatar images for the email address you specified. The second image is smaller than the first.



Displaying an Xbox Gamer Card

When people play Microsoft Xbox games online, each user has a unique ID. Statistics are kept for each player in the form of a gamer card, which shows their reputation, gamer score, and recently played games. If you're an Xbox gamer, you can show your gamer card on pages in your site by using the `GamerCard` helper.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already.
2. Create a new page named *XboxGamer.cshtml* and add the following markup.

```
<!DOCTYPE html>
<html>
  <head>
    <title>Xbox Gamer Card</title>
  </head>
  <body>
    <h1>Xbox Gamer Card</h1>
    @GamerCard.GetHtml("major nelson")
  </body>
</html>
```

   You use the `GamerCard.GetHtml` property to specify the alias for the gamer card to be displayed.

3. Run the page in your browser. The page displays the Xbox gamer card that you specified.

Displaying a Facebook "Like" Button

You can make it easy for people to share your content with their Facebook friends by using the `Facebook` helper's `LikeButton` method.

The `Facebook` helper renders a **Like** button itself as well as a count (which is read from Facebook) of how many other people have clicked **Like** for the page:

When people click the Facebook **Like** button on your site, a link appears on the user's Facebook feed that says that they "Like" the page.

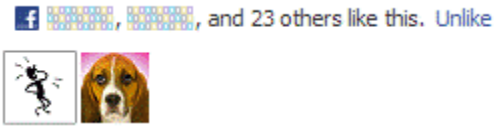
By default, the `Facebook` helper's `LikeButton` method generates a **Like** button that points to the current page. That's the most common scenario — when you see a **Like** button, it's giving you a chance to create a Facebook link to whatever you're reading at the moment. Alternatively, you can pass a URL to the `Facebook` helper using the `LikeButton` method. In that case, the **Like** link in Facebook points to whatever page you've specified. This is useful if the page you're on lists other sites and you want to provide a **Like** button for each of those sites individually.

The `LikeButton` method lets you specify options for how to display the **Like** button, including:

- Whether the link shows a **Like** link or a **Recommend** link.

- How to show the count of the other people who like the page:

- Whether to show Facebook profile pictures of the people who have already liked the page:



- The width and color scheme (`light` or `dark`) of the **Like** button display.

In the following example, you'll create two **Like** buttons. One points to the current page, and the other points to a specific URL (the ASP.NET WebMatrix website). To test the example, you must have a Facebook account.

1. Add the Facebook.Helper library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already. (Note that the `Facebook` helper is in a different library than many of the other helpers.)
2. Create a new page named *FacebookLikeBtn.cshtml* and add the following markup.

```
<!DOCTYPE html>
<html>
    <head>
        <title>Facebook 'Like' Button</title>
        <style>body {font-family:verdana;font-size:9pt;}</style>
    </head>
    <body>
    <p>Points to the current page, uses default settings:</p>
        @Facebook.LikeButton()

    <p>Points to the ASP.NET Web site:</p>
         @Facebook.LikeButton(
          href: "http://www.asp.net/webmatrix",
          action: "recommend",
          width: 250,
          buttonLayout: "button_count",
          showFaces: true,
          colorScheme: "dark")
    </body>
</html>
```

The first instance of the `Facebook.LikeButton` method uses all default settings, so it points to the current page. The second instance includes options. You use the `url` parameter to specify the URL to like. To change **Like** to **Recommend**, you set the action parameter to "recommend" (the default is "like"). To specify the "button" style for the count, you set the layout parameter to "button_count" (versus "standard" or "box_count"). To show Facebook profile pictures below the **Like** button, you set the `showFaces` parameter to true. Finally, to set the color scheme, you set the `colorScheme` parameter to "dark" (the default is "light").

3. Run the web page in your browser. The page displays the Facebook **Like** buttons that you specified.

4. Click the **Recommend** button that points to the ASP.NET website. If you're not logged into Facebook, you're prompted to do so. When you are, you'll be able to see the **Recommend** link on your wall.

   If you're testing the page within WebMatrix, you won't be able to test the first link (the **Like** button that points to the current page). Because you're running on the local computer (using the `localhost` URL), Facebook can't link back to you. However, once your site goes live, the link will work.

Additional Resources

- ASP.NET Web Pages with Razor Syntax Reference

Chapter 14 – Analyzing Traffic

After you've gotten your website going, you might want to analyze your website traffic.

What you'll learn

- How to send information about your website traffic to an analytics provider.

These are the ASP.NET programming features introduced in the chapter:

- The `Analytics` helper.

Tracking Visitor Information (Analytics)

Analytics is a general term for technology that measures traffic on your website so you can understand how people use the site. Many analytics services are available, including services from Google, Yahoo, StatCounter, and others.

The way analytics works is that you sign up for an account with the analytics provider, where you register the site that you want to track. The provider sends you a snippet of JavaScript code that includes an ID for your account. You add the JavaScript snippet to the web pages on the site that you want to track. (You typically add the analytics snippet to a footer or layout page or other HTML markup that appears on every page in your site.) When users request a page that contains one of these JavaScript snippets, the snippet sends information about the current page to the analytics provider, who records various details about the page.

When you want to have a look at your site statistics, you log into the analytics provider's website. You can then view all sorts of reports about your site, like:

- The number of page views for individual pages. Obviously, this tells you (roughly) how many people are visiting the site, and which pages on your site are the most popular.
- How long people spend on specific pages. This can tell you things like whether your home page is keeping people's interest.
- What sites people were on before they visited your site. This helps you understand whether your traffic is coming from links, from searches, and so on.
- When people visit your site and how long they stay.
- What countries your visitors are from.
- What browsers and operating systems your visitors are using.

ASP.NET includes several analytics helpers (`Analytics.GetGoogleHtml`, `Analytics.GetYahooHtml`, and `Analytics.GetStatCounterHtml`) that make it easy to manage the JavaScript snippets used for analytics. Instead of figuring out how and where to put the JavaScript code, all you have to do is add the helper to a page. The only information you need to provide is your account name. (For StatCounter, you also have to provide a few additional values.)

In this procedure, you'll create a layout page that uses the `GetGoogleHtml` helper. If you already have an account with one of the other analytics providers, you can use that account instead.

> **Note** When you create an analytics account, you register the URL of the site that you want to be tracking. If you're testing everything on your local computer, you won't be tracking actual traffic (the only traffic is you), so you won't be able to record and view site statistics. But this procedure shows how you add an analytics helper to a page. When you publish your site, the live site will send information to your analytics provider.

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already added it.
2. Create an account with Google Analytics and record the account name.
3. Create a layout page named *Analytics.cshtml* and add the following markup:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Analytics Test</title>
  </head>
  <body>
    <h1>Analytics Test Page</h1>
    <p>Lorem ipsum dolor sit amet, consectetur adipisicing elit,
    sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. </p>
    <div id="footer">
      &copy; 2010 MySite
    </div>
```

```
    @Analytics.GetGoogleHtml("myaccount")
  </body>
</html>
```

Note You must place the call to the `Analytics` helper in the body of your web page (before the `</body>` tag). Otherwise, the browser will not run the script.

If you're using a different analytics provider, use one of the following helpers instead:

- (Yahoo) `@Analytics.GetYahooHtml("myaccount")`
- (StatCounter) `@Analytics.GetStatCounterHtml("project", "security")`

4. Replace `myaccount` with the name of the account that you created in step 1.
5. Run the page in the browser. (Make sure the page is selected in the **Files** workspace before you run it.)
6. In the browser, view the page source. You'll be able to see the rendered analytics code:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Analytics Test</title>
  </head>
  <body>
    <h1>Analytics Test Page</h1>
    <p>Lorem ipsum dolor sit amet, consectetur adipisicing elit,
    sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.</p>
    <div id="footer">
      &copy; 2010 MySite
    </div>
    <script type="text/javascript">
      var gaJsHost = (("https:" == document.location.protocol) ? "https://ssl." :
"http://www.");
      document.write(unescape("%3Cscript src='" + gaJsHost + "google-
analytics.com/ga.js' type='text/javascript'%3E%3C/script%3E"));
    </script>
    <script type="text/javascript">
      try{
      var pageTracker = _gat._getTracker("myaccount");
      pageTracker._trackPageview();
      } catch(err) {}
    </script>
  </body>
</html>
```

7. Log onto the Google Analytics site and examine the statistics for your site. If you're running the page on a live site, you see an entry that logs the visit to your page.

Chapter 15 – Caching to Improve the Performance of Your Website

You can speed up your website by having it store — that is, cache — the results of data that ordinarily would take considerable time to retrieve or process and that does not change often.

What you'll learn

- How to use caching to improve the responsiveness of your website.

These are the ASP.NET features introduced in the chapter:

- The `WebCache` helper.

Caching to Improve Website Responsiveness

Every time someone requests a page from your site, the web server has to do some work in order to fulfill the request. For some of your pages, the server might have to perform tasks that take a (comparatively) long time, such as retrieving data from a database. Even if in absolute terms one of these tasks doesn't take long, if your site experiences a lot of traffic, a whole series of individual requests that cause the web server to perform the complicated or slow task can add up to a lot of work. This can ultimately affect the performance of the site.

One way to improve the performance of your website in circumstances like this is to cache data. If your site gets repeated requests for the same information, and the information does not need to be modified for each person, and it's not time sensitive, instead of re-fetching or recalculating it, you can fetch the data once and then store the results. The next time a request comes in for that information, you just get it out of the cache.

In general, you cache information that doesn't change frequently. When you put information in the cache, it's stored in memory on the web server. You can specify how long it should be cached, from seconds to days. When the caching period expires, the information is automatically removed from the cache.

> **Note** Entries in the cache might be removed for reasons other than that they've expired. For example, the web server might temporarily run low on memory, and one way it can reclaim memory is by throwing entries out of the cache. As you'll see, even if you've put information into the cache, you have to check to be sure it's still there when you need it.

Imagine your website has a page that displays the current temperature and weather forecast. To get this type of information, you might send a request to an external service. Since this information doesn't change much (within a two-hour time period, for example) and since external calls require time and bandwidth, it's a good candidate for caching.

ASP.NET includes a `WebCache` helper that makes it easy to add caching to your site and add data to the cache. In this procedure, you'll create a page that caches the current time. This isn't a real-world example, since the current time is something that does change often, and that moreover isn't complex to calculate. However, it's a good way to illustrate caching in action.

1. Add a new page named *WebCache.cshtml* to the website.
2. Add the following code and markup to the page:

```
@{
    var cacheItemKey = "Time";
    var cacheHit = true;
    var time = WebCache.Get(cacheItemKey);

    if (time == null) {
        cacheHit = false;
    }

    if (cacheHit == false) {
        time = @DateTime.Now;
        WebCache.Set(cacheItemKey, time, 1, false);
    }
}
<!DOCTYPE html>
<html>
<head>
    <title>WebCache Helper Sample</title>
</head>
<body>
    <div>
        @if (cacheHit) {
            @:Found the time data in the cache.
        } else {
            @:Did not find the time data in the cache.
        }
    </div>
    <div>
        This page was cached at @time.
    </div>
</body>
</html>
```

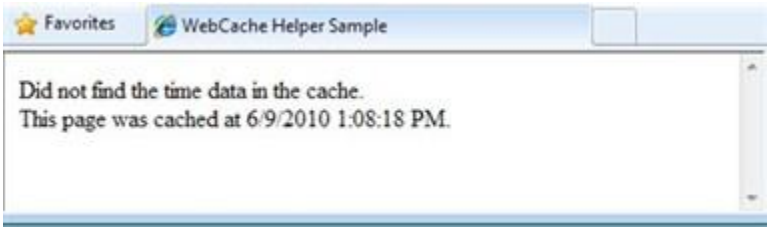
When you cache data, you put it into the cache using a name this is unique across the website. In this case, you'll use a cache entry named `Time`. This is the `cacheItemKey` shown in the code example.

The code first reads the `Time` cache entry. If a value is returned (that is, if the cache entry isn't null), the code just sets the value of the time variable to the cache data.

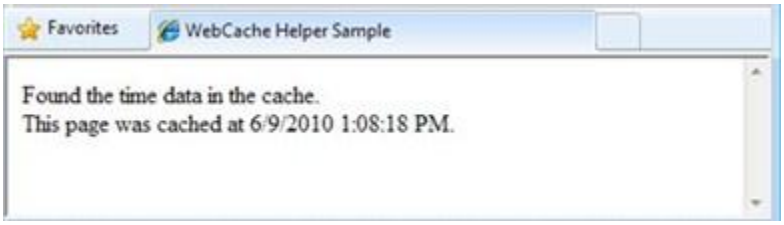
However, if the cache entry doesn't exist (that is, it's null), the code sets the time value, adds it to the cache, and sets an expiration value to one minute. If the page isn't requested again within one minute, the cache entry is discarded. (The default expiration value for an item in the cache is 20 minutes.)

This code illustrates the pattern you should always use when you cache data. Before you get something out of the cache, always check first whether the `WebCache.Get` method has returned null. Remember that the cache entry might have expired or might have been removed for some other reason, so any given entry is never guaranteed to be in the cache.

3. Run *WebCache.cshtml* in a browser. (Make sure the page is selected in the **Files** workspace before you run it.) The first time you request the page, the time data isn't in the cache, and the code has to add the time value to the cache.



4. Refresh *WebCache.cshtml* in the browser. This time, the time data is in the cache. Notice that the time hasn't changed since the last time you viewed the page.



5. Wait one minute for the cache to be emptied, and then refresh the page. The page again indicates that the time data wasn't found in the cache, and the updated time is added to the cache.

Additional Resources

- Chapter 7 - Displaying Data in a Chart

Chapter 16 – Adding Security and Membership

This chapter shows you how to secure your website so that some of the pages are available only to people who log in. (You'll also see how to create pages that anyone can access.)

What you'll learn

- How to create a website that has a registration page and a login page so that for some pages you can limit access to only members.
- How to create public and member-only pages.
- How to use CAPTCHA to prevent automated programs (bots) from creating member accounts.

These are the ASP.NET features introduced in the chapter:

- The `WebSecurity` helper.
- The `SimpleMembership` helper.
- The `ReCaptcha` helper.

Introduction to Website Membership

You can set up your website so that users can log into it — that is, so that the site supports membership. This can be useful for many reasons. For example, your site might have features that are available only to members. In some cases, you might require users to log in in order to send you feedback or leave a comment.

Even if your website supports membership, users aren't necessarily required to log in before they use some of the pages on the site. Users who aren't logged in are known as *anonymous users*.

A user can register on your website and can then log in to the site. The website requires a user name (often an email address) and a password to confirm that users are who they claim to be. This process of logging in and confirming a user's identity is known as *authentication*.

In WebMatrix, you can use the Starter Site template to create a website that contains the following:

- A database that's used to store user names and passwords for your members.
- A registration page where anonymous (new) users can register.
- A login and logout page.
- A password recovery and reset page.

> **Note** Although the Start Site template automatically creates these pages for you, in this chapter you'll create simplified versions of them manually in order to learn the basics of ASP.NET security and membership.

Creating a Website That Has Registration and Login Pages

1. Start WebMatrix.
2. In the **Quick Start** page, select **Site From Template**.
3. Select the **Starter Site** template and then click **OK**. WebMatrix creates a new site.
4. In the left pane, click the **Files** workspace selector.
5. In the root folder of your website, open the *_AppStart.cshtml* file, which is a special file that's used to contain global settings. It contains some statements that are commented out using the `//` characters:

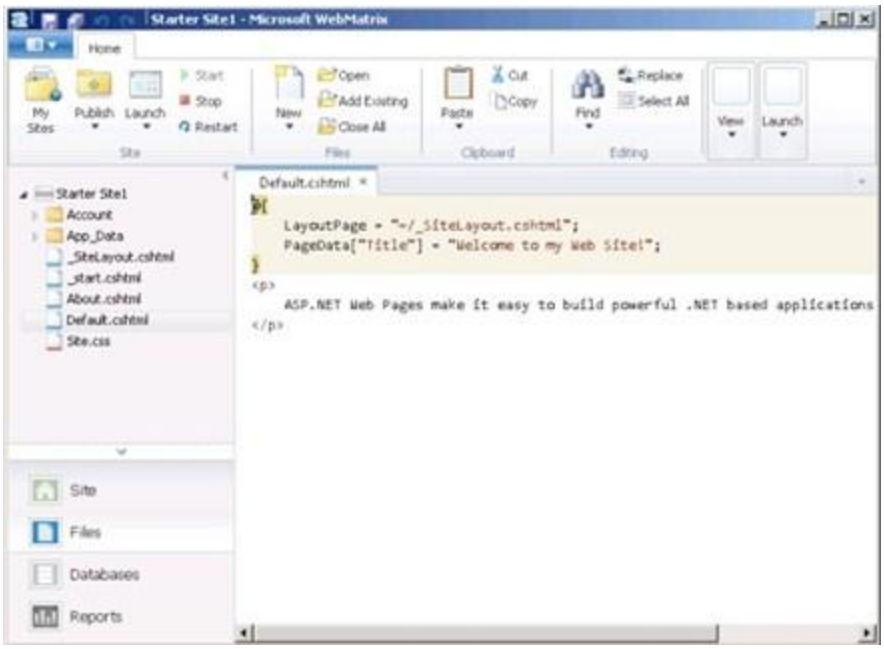
```
@{
   WebSecurity.InitializeDatabaseConnection("StarterSite", "UserProfile", "UserId",
         "Email", true);
    // WebMail.SmtpServer = "mailserver.example.com";
    // WebMail.EnableSsl = true;
    // WebMail.UserName = "username@example.com";
    // WebMail.Password = "your-password";
    // WebMail.From = "your-name-here@example.com";
}
```

   In order to be able to send email, you can use the `WebMail` helper. This in turn requires access to an SMTP server, as described in Chapter 11 - Adding Email to your Website. That chapter showed you how to set various SMTP settings in a single page. In this chapter, you'll use those same settings, but you'll store them in a central file so that you don't have to keep coding them into each page. (You don't need to configure SMTP settings to set up a registration database; you only need SMTP settings if you want to validate users from their email alias and let users reset a forgotten password.)

6. Uncomment the statements. (Remove `//` from in front of each one.)
7. Modify the following email-related settings in the code:

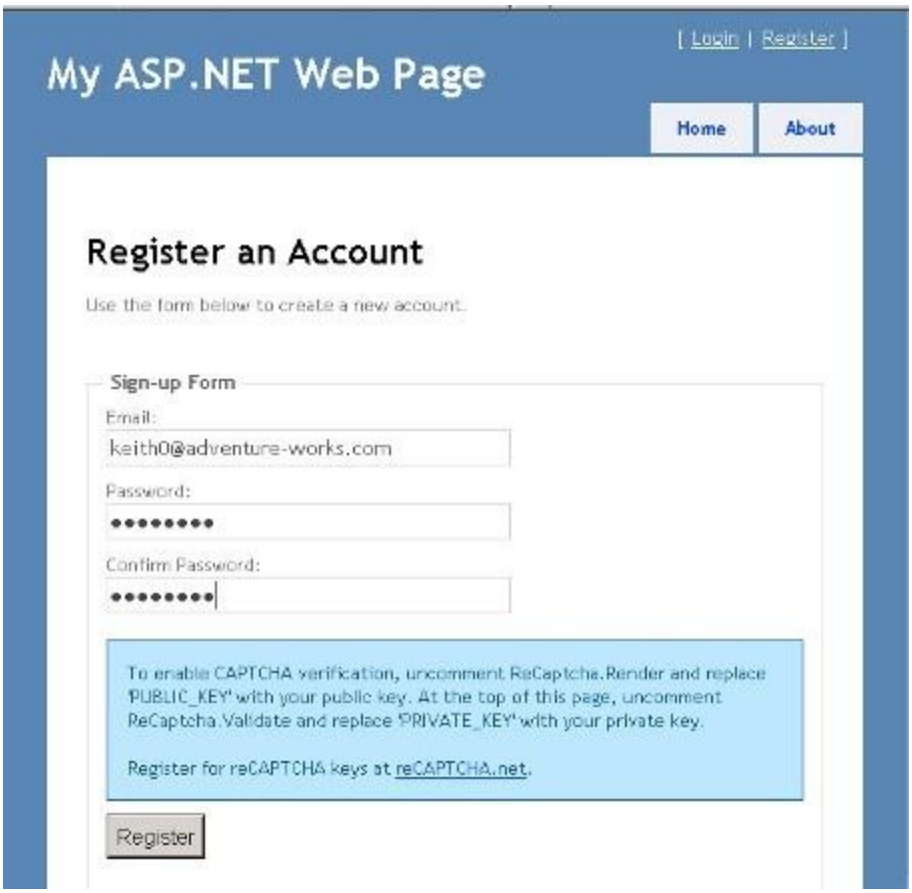
   - Set `WebMail.SmtpServer` to the name of the SMTP server that you have access to.
   - Leave `WebMail.EnableSsl` set to `true`. This setting secures the credentials that are sent to the SMTP server by encrypting them.
   - Set `WebMail.UserName` to the user name for your SMTP server account.
   - Set `WebMail.Password` to the password for your SMTP server account.
   - Set `WebMail.From` to your own email address. This is the email address that the message is sent from.

8. Save and close *_AppStart.cshtml*.
9. Open the *Default.cshtml* file.



10. Run the *Default.cshtml* page in a browser.

11. In the upper-right corner of the page, click the **Register** link.
12. Enter a user name and password and then click **Register**.



When you created the website from the **Starter Site** template, a database named *StarterSite.sdf* was created in the site's *App_Data* folder. During registration, your user information is added to the database. A message is sent to the email address you used so you can finish registering.

13. Go to your email program and find the message, which will have your confirmation code and a hyperlink to the site.

14. Click the hyperlink to activate your account. The confirmation hyperlink opens a registration confirmation page.

15. Click the **Login** link, and then log in using the account that you registered.

    After you log in, the **Login** and **Register** links are replaced by a **Logout** link.

16. Click the **About** link.

    The *About.cshtml* page is displayed. Right now, the only visible change when you log in is a change to the logged-in status (the message **Welcome Joe!** and a **Logout** link).

> **Note** By default, ASP.NET web pages send credentials to the server in clear text (as human-readable text). A production site should use secure HTTP (https://, also known as the secure sockets layer or SSL) to encrypt sensitive information that's exchanged with the server. You can encrypt sensitive information by setting `WebMail.EnableSsl=true` as in the previous example. For more information about SSL, see Securing Web Communications: Certificates, SSL, and https://.

Creating a Members-Only Page

For the time being, anyone can browse to any page in your website. But you might want to have pages that are available only to people who have logged in (that is, to members). ASP.NET lets you configure pages so they can be accessed only by logged-in members. Typically, if anonymous users try to access a members-only page, you redirect them to the login page.

In this procedure, you'll limit access to the About page (*About.cshtml*) so that only logged-in users can access it.

1. Open the *About.cshtml* file. This is a content page that uses the *_SiteLayout.cshtml* page as its layout page. (For more about layout pages, see Chapter 3 - Creating a Consistent Look.)
2. Replace all the code in the *About.cshtml* file with the following code. This code tests the `IsAuthenticated` property of the `WebSecurity` object, which returns `true` if the user has logged in. Otherwise, the code calls `Response.Redirect` to send the user to the *Login.cshtml* page in the *Account* folder. Here's the complete *About.cshtml* file:

```
@if (!WebSecurity.IsAuthenticated) {
      Response.Redirect("~/Account/Login");
 }

@{
    Layout = "~/_SiteLayout.cshtml";
    Page.Title = "About My Site";
}

<p>
This web page was built using ASP.NET Web Pages. For more information,
visit the ASP.NET home page at <a href="http://www.asp.net"
target="_blank">http://www.asp.net</a>
</p>
```

> **Note** The URLs in the example (like *~/Account/Login*) don't include the *.cshtml* file extension. ASP.NET does not require file extensions in URLs that point to *.cshtml* pages. For more information, see the section on routing in Chapter 18 - Customizing Site-Wide Behavior.

3. Run *Default.cshtml* in a browser. If you're logged into the site, click the **Logout** link.
4. Click the **About** link. You're redirected to the *Login.cshtml* page, because you aren't logged in.

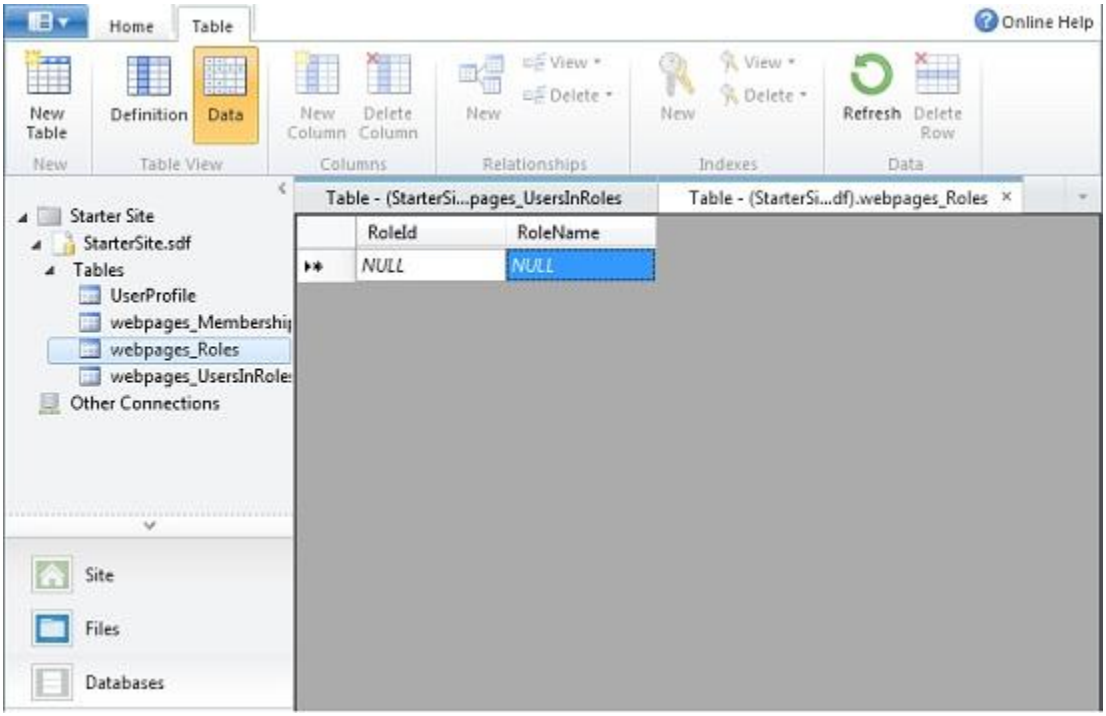
   To secure access to multiple pages, you can either add the security check to each page or you can create a layout page similar to *_SiteLayout.cshtml* that includes the security check. You would then reference the layout page with the security-check from the other pages in your site, in the same way that *Default.cshtml* currently references *_SiteLayout.cshtml*.

Creating Security for Groups of Users (Roles)

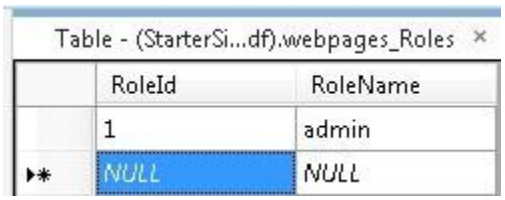
If your site has a lot of members, it's not efficient to check permission for each user individually before you let them see a page. What you can do instead is to create groups, or *roles*, that individual members belong to. You can then check permissions based on role. In this section, you'll create an "admin" role and then create a page that's accessible to users who are in (who belong to) that role.

To begin, you need to add role information to the members database.

1. In WebMatrix, click the **Databases** workspace selector.
2. In the left pane, open the *StarterSite.sdf* node, open the **Tables** node, and then double-click the *webpages_Roles* table.



3. Add a role named "admin". The *RoleId* field is filled in automatically. (It's the primary key and has been set to be an identify field, as explained in Chapter 5 - Working with Data.)
4. Take note of what the value is for the *RoleId* field. (If this is the first role you're defining, it will be 1.)



5. Close the *webpages_Roles* table.
6. Open the *UserProfile* table.

7. Make a note of the *UserId* value of one or more of the users in the table and then close the table.
8. Open the *webpages_UserInRoles* table and enter a *UserID* and a *RoleID* value into the table. For example, to put user 3 into the "admin" role, you'd enter these values:

9. Close the *webpages_UsersInRoles* table.

   Now that you have roles defined, you can configure a page that's accessible to users who are in that role.

10. In the website root folder, create a new page named *AdminError.cshtml* and replace the existing content with the following code. This will be the page that users are redirected to if they aren't allowed access to a page.

```
@{
    Layout = "~/_SiteLayout.cshtml";
    PageData["Title"] = "Admin-only Error";
}
<p>You must log in as an admin to access that page.</p>
```

11. In the website root folder, create a new page named *AdminOnly.cshtml* and replace the existing code with the following code:

```
@{
    Layout = "~/_SiteLayout.cshtml";
    PageData["Title"] = "Administrators only";
}

@if ( Roles.IsUserInRole("admin")) {
    <span> Welcome <b>@WebSecurity.CurrentUserName</b>! </span>
}
else {
     Response.Redirect("~/AdminError");
}
```

    The `Roles.IsUserInRole` method returns `true` if the current user is a member of the "admin" role.

12. Run *Default.cshtml* in a browser, but don't log in. (If you're already logged in, log out.)
13. In the browser's address bar, change "Default" to "AdminOnly" in the URL. (In other words, request the *AdminOnly.cshtml* file.) You're redirected to the *AdminError.cshtml* page, because you aren't currently logged in as a user in the "admin" role.
14. Return to *Default.cshtml* and log in as the user you added to the "admin" role.
15. Browse to *AdminOnly.cshtml* page. This time you see the page.

Creating a Password-Change Page

You can let users change their passwords by creating a password-change page. This example shows the basics of a page that does this. (The Starter Site template includes a *ChangePassword.cshtml* file that contains more complete error checking than the page that you'll create in this procedure.)

1. In the *Account* folder of the website, create a page named *ChangePassword2.cshtml*.
2. Replace the contents with the following code:

```
@{
   Layout = "~/_SiteLayout.cshtml";
   PageData["Title"] = "Change Password";

   var message = "";
   if(IsPost) {

        string username = Request["username"];
        string newPassword = Request["newPassword"];
        string oldPassword = Request["oldPassword"];

        if(WebSecurity.ChangePassword(username, oldPassword, newPassword)) {
            message="Password changed successfully!";
        }
        else
       {
           message="Password could not be changed.";
       }
    }
}
<style>
        .message  {font-weight:bold; color:red; margin:10px;}
</style>
<form method="post" action="">
  Username: <input type="text" name="username"
    value="@WebSecurity.CurrentUserName" />
  <br/>
  Old Password: <input type="password" name="oldPassword" value="" />
  <br/>
  New Password: <input type="password" name="newPassword" value="" />
```

```
  <br/><br/>
  <input type="submit" value="Change Password" />
  <div class="message">@message</div>
  <div><a href="Default.cshtml">Return to home page</a></div>
</form>
```

The body of the page contains text boxes that let users enter their user name and old and new passwords. In the code, you call the `WebSecurity` helper's `ChangePassword` method and pass it the values you get from the user.

3. Run the page in a browser. If you're already logged in, your user name is displayed in the page.
4. Try entering your old password incorrectly. When you don't enter a correct password, the `WebSecurity.ChangePassword` method fails and a message is displayed.

5. Enter valid values and try changing your password again.

Letting Users Generate a New Password

If users forget their password, you can let them generate a new one. (This is different from changing a password that they know.) To let users get a new password, you use the `WebSecurity` helper's `GeneratePasswordResetToken` method to generate a token. A token is a cryptographically secure string that's sent to the user and that uniquely identifies the user for purposes like resetting a password. This procedure shows a typical way to do all this — generate the token, send it to the user in email, and then link to a page that reads the token and lets the user enter a new password. The link that the user will see in email will look something like this:

http://localhost:36916/Account/PasswordReset2?PasswordResetToken=08HZGH0ALZ3CGz3

The random-looking characters at the end of the URL are the token.

(The Starter Site template includes a *ForgotPassword.cshtml* file that contains more complete error checking than the sample below.)

1. In the *Account* folder of the website, add a new page named *ForgotPassword2.cshtml*.
2. Replace the existing content with the following code:

```
@{
  Layout = "~/_SiteLayout.cshtml";
  PageData["Title"] = "Forgot your password?";

  var message = "";
  var username = "";

  if (WebMail.SmtpServer.IsEmpty() ){
    // The default SMTP configuration occurs in _start.cshtml
    message = "Please configure the SMTP server.";
   }

  if(IsPost) {
    username = Request["username"];
    var resetToken = WebSecurity.GeneratePasswordResetToken(username);

    var portPart = ":" + Request.Url.Port;
    var confirmationUrl = Request.Url.Scheme
      + "://"
      + Request.Url.Host
      + portPart
      + VirtualPathUtility.ToAbsolute("~/Account/PasswordReset2?PasswordResetToken="
      + Server.UrlEncode(resetToken));

    WebMail.Send(
      to: username,
      subject: "Password Reset",
      body: @"Your reset token is:<br/><br/>"
        + resetToken
        + @"<br/><br/>Visit <a href="""
        + confirmationUrl
        + @""">"
        + confirmationUrl
        + @"</a> to activate the new password."
    );

    message = "An email has been sent to " + username
        + " with a password reset link.";
  }
}
<style>
    .message  {font-weight:bold; color:red; margin:10px;}
</style>
<form method="post" action="">
```

```
  @if(!message.IsEmpty()) {
    <div class="error">@message</div>
  } else{
  <div>
  Enter your email address: <input type="text" name="username" /> <br/>
  <br/><br/>
  <input type="submit" value="Get New Password" />
  </div>
  }
</form>
```

The body of the page contains the text box that prompts the user for an email address. When the user submits the form, you first make sure that the SMTP mail settings have been made, since the point of the page is to send an email message.

The heart of the page is in creating the password-reset token, which you do this way, passing the email address (user name) that the user provided:

```
string resetToken = WebSecurity.GeneratePasswordResetToken(username);
```

The rest of the code is for sending the email message. Most of it is adapted from what's already in the *Register.cshtml* file that was created as part of your site from the template.

You actually send the email by calling the `WebMail` helper's `Send` method. The body of the email is created by concatenating together variables with strings that include both text and HTML elements. When a user gets the email, the body of it looks something like this:

3. In the *Account* folder, create another new page named *PasswordReset2.cshtml* and replace the contents with the following code:

```
@{
  Layout  = "~/_SiteLayout.cshtml";
  PageData["Title"] = "Password Reset";

  var message = "";
  var passwordResetToken = "";

  if(IsPost) {
    var newPassword = Request["newPassword"];
    var confirmPassword = Request["confirmPassword"];
    passwordResetToken = Request["passwordResetToken"];

    if( !newPassword.IsEmpty() &&
       newPassword == confirmPassword &&
       WebSecurity.ResetPassword(passwordResetToken, newPassword)) {
```

```
            message = "Password changed!";
        }
        else {
          message = "Password could not be reset.";
        }
      }
    }
    <style>
        .message  {font-weight:bold; color:red; margin:10px;}
    </style>
    <div class="message">@message</div>
    <form method="post" action="">
      Enter your new password: <input type="password" name="newPassword" /> <br/>
      Confirm new password:    <input type="password" name="confirmPassword" /><br/>
      <br/>
      <input type="submit" value="Submit"/>
    </form>
```

This page is what runs when the user clicks the link in the email to reset their password. The body contains text boxes to let the user enter a password and confirm it.

You get the password token out of the URL by reading `Request["PasswordResetToken"]`. Remember that the URL will look something like this:

http://localhost:36916/Account/PasswordReset2?PasswordResetToken=08HZGH0ALZ3CGz3

Your code gets the token (here, *08HZGH0ALZ3CGz3)* and then calls the `WebSecurity` helper's `ResetPassword` method, passing it the token and the new password. If the token is valid, the helper updates the password for the user who got the token in email. If the reset is successful, the `ResetPassword` method returns `true`.

In this example, the call to `ResetPassword` is combined with some validation checks using the `&&` (logical AND) operator. The logic is that the reset is successful if:

- The `newPassword` text box is not empty (the ! operator means *not*); and
- The values in `newPassword` and `confirmPassword` match; and
- The `ResetPassword` method was successful.

4. Run *ForgotPassword2.cshtml* in a browser.

5. Enter your email address and then click **Get New Password**. The page sends an email. (There might be a short delay while it does this.)

6. Check your email and look for a message whose subject line is "Password Reset."
7. In the email, click the link. You're taken to the *PasswordReset2.cshtml* page.
8. Enter a new password and then click **Submit**.

Preventing Automated Programs from Joining Your Website

The login page will not stop automated programs (sometimes referred to as *web robots* or *bots*) from registering with your website. (A common motivation for bots joining groups is to post URLs of products for sale.) You can help make sure the user is real person and not a computer program by using a CAPTCHA test to validate the input. (CAPTCHA stands for Completely Automated Public Turing test to tell Computers and Humans Apart.)

In ASP.NET pages, you can use the `ReCaptcha` helper to render a CAPTCHA test that is based on the reCAPTCHA service (http://recaptcha.net). The `ReCaptcha` helper displays an image of two distorted words that users have to enter correctly before the page is validated. The user response is validated by the ReCaptcha.Net service.

1. Register your website at ReCaptcha.Net (http://recaptcha.net). When you've completed registration, you'll get a public key and a private key.
2. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already.

3. In the *Account* folder, open the file named *Register.cshtml*.
4. Remove the `//` comment characters for the `captchaMessage` variable.
5. Replace the `PRIVATE_KEY` string with your private key.
6. Remove the `//`comment characters from the line that contains the `ReCaptcha.Validate` call.

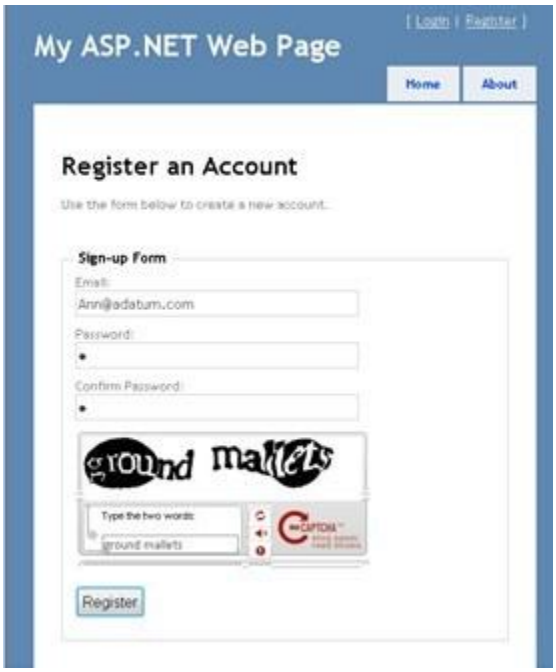
   The following example shows the completed code. (Substitute your key for `user-key-here`.)

```
// Validate the user's response
if (!ReCaptcha.Validate("user-key-here")) {
   captchaMessage = "Response was not correct";
   isValid = false;
}
```

6. At the bottom of the *Register.cshtml* page, replace the `PUBLIC_KEY` string with your public key.
7. Remove the comment characters from the line that contains the `ReCaptcha` call. The following example shows the completed code (except that you again substitute your key for `user-key-here`):

```
@ReCaptcha.GetHtml("user-key-here", theme: "white")
```

8. Run *Default.cshtml* in a browser. If you're logged into the site, click the **Logout** link.
9. Click the **Register** link and test the registration using the CAPTCHA test.



Note If your computer is on a domain that uses proxy server, you might need to configure the `defaultproxy` element of the *Web.config* file. The following example shows a *Web.config* file with the `defaultproxy` element configured to enable the reCAPTCHA service to work.

```
<?xml version="1.0" encoding="utf-8"?>
```

```
<configuration>
  <system.net>
      <defaultProxy>
         <proxy
            usesystemdefault = "false"
            proxyaddress="http://myProxy.MyDomain.com"
            bypassonlocal="true"
            autoDetect="False"
         />
      </defaultProxy>
   </system.net>
</configuration>
```

Additional Resources

- Chapter 18 - Customizing Site-Wide Behavior
- Securing Web Communications: Certificates, SSL, And Https://

Chapter 17 – Introduction to Debugging

Debugging is the process of finding and fixing errors in your code pages. This chapter shows you some tools and techniques you can use to debug and to analyze your site.

What you'll learn

- How to display information that helps analyze and debug pages.
- How to use debugging tools such as Internet Explorer Developer Tools and Firebug to analyze web pages.

These are the ASP.NET features and WebMatrix (and other) tools introduced in the chapter:

- The `ServerInfo` helper.
- The `ObjectInfo` helper.
- The Internet Explorer Developer Tools and the Firebug debugging tool.

An important aspect of troubleshooting errors and problems in your code is to avoid them in the first place. You can do that by putting sections of your code that are likely to cause errors into `try/catch` blocks. For more information, see the section on handling errors in Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax. For information about using the integrated debugger in Visual Studio to debug ASP.NET Razor pages, see Appendix – Programming ASP.NET Web Pages in Visual Studio.

Using the ServerInfo Helper to Display Server Information

The `ServerInfo` helper is a diagnostic tool that gives you an overview of information about the web server environment that hosts your page. It also shows you HTTP request information that's sent when a browser requests the page. The `ServerInfo` helper displays the current user identity, the type of browser that made the request, and so on. This kind of information can help you troubleshoot common issues.

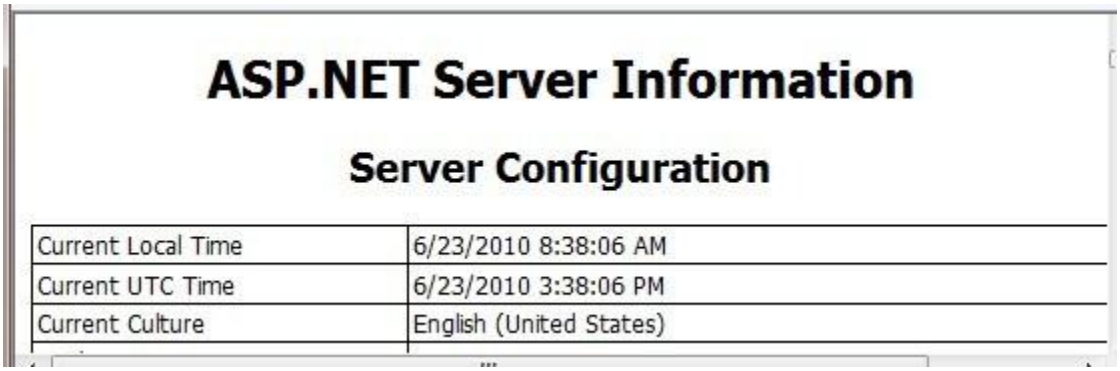
1. Create a new web page named *ServerInfo.cshtml*.
2. At the end of the page, just before the closing `</body>` tag, add `@ServerInfo.GetHtml()`:

```
<!DOCTYPE html>
<html>
    <head>
        <title></title>
    </head>
    <body>
   @ServerInfo.GetHtml()
    </body>
</html>
```

You can add the `ServerInfo` code anywhere in the page. But adding it at the end will keep its output separate from your other page content, which makes it easier to read.

> **Note** You should remove any diagnostic code from your web pages before you move web pages to a production server. This applies to the `ServerInfo` helper as well as the other diagnostic techniques in this chapter that involve adding code to a page. You don't want your website visitors to see information about your server name, user names, paths on your server, and similar details, because this type of information might be useful to people with malicious intent.

3. Save the page and run it in a browser. (Make sure the page is selected in the **Files** workspace before you run it.)



The `ServerInfo` helper displays four tables of information in the page:

- Server Configuration. This section provides information about the hosting web server, including computer name, the version of ASP.NET you're running, the domain name, and server time.
- ASP.NET Server Variables. This section provides details about the many HTTP protocol details (called HTTP variables) and values that are part of each web page request.
- HTTP Runtime Information. This section provides details about that the version of the Microsoft .NET Framework that your web page is running under, the path, details about the cache, and so on. (As you learned in Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax, ASP.NET Web Pages using the Razor syntax are built on Microsoft's ASP.NET web server technology, which is itself built on an extensive software development library called the .NET Framework.)
- Environment Variables. This section provides a list of all the local environment variables and their values on the web server.

A full description of all the server and request information is beyond the scope of this chapter, but you can see that the `ServerInfo` helper returns a lot of diagnostic information. For more information about the values that `ServerInfo` returns, see Recognized Environment Variables on the Microsoft TechNet website and IIS Server Variables on the MSDN website.

Embedding Output Expressions to Display Page Values

Another way to see what's happening in your code is to embed output expressions in the page. As you know, you can directly output the value of a variable by adding something like `@myVariable` or `@(subTotal * 12)` to the page. For debugging, you can place these output expressions at strategic points in your code. This enables you to see the value of key variables or the result of calculations when your page runs. When you're done debugging, you can remove the expressions or comment them out. This procedure illustrates a typical way to use embedded expressions to help debug a page.

1. Create a new WebMatrix page that's named *OutputExpression.cshtml*.
2. Replace the page content with the following:

```
<!DOCTYPE html>
<html>
    <head>
        <title></title>
    </head>
    <body>

    @{
        var weekday = DateTime.Now.DayOfWeek;
        // As a test, add 1 day to the current weekday.
        if(weekday.ToString() != "Saturday") {
            // If weekday is not Saturday, simply add one day.
            weekday = weekday + 1;
        }
        else {
            // If weekday is Saturday, reset the day to 0, or Sunday.
            weekday = 0;
        }
        // Convert weekday to a string value for the switch statement.
        var weekdayText = weekday.ToString();

        var greeting = "";

        switch(weekdayText)
        {
            case "Monday":
                greeting = "Ok, it's a marvelous Monday.";
                break;
            case "Tuesday":
                greeting = "It's a tremendous Tuesday.";
                break;
            case "Wednesday":
                greeting = "Wild Wednesday is here!";
                break;
            case "Thursday":
                greeting = "All right, it's thrifty Thursday.";
                break;
            case "Friday":
                greeting = "It's finally Friday!";
                break;
            case "Saturday":
                greeting = "Another slow Saturday is here.";
                break;
```

```
            case "Sunday":
                greeting = "The best day of all: serene Sunday.";
                break;
            default:
                break;
        }
    }

    <h2>@greeting</h2>

    </body>
</html>
```

The example uses a `switch` statement to check the value of the `weekday` variable and then display a different output message depending on which day of the week it is. In the example, the `if` block within the first code block arbitrarily changes the day of the week by adding one day to the current weekday value. This is an error introduced for illustration purposes.

3. Save the page and run it in a browser.

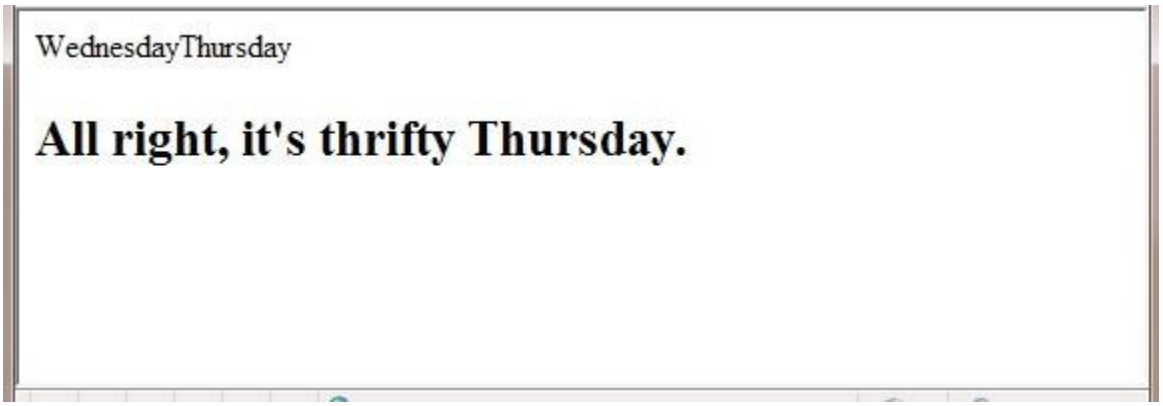
   The page displays the message for the wrong day of the week. Whatever day of the week it actually is, you'll see the message for one day later. Although in this case you know why the message is off (because the code deliberately sets the incorrect day value), in reality it's often hard to know where things are going wrong in the code. To debug, you need to find out what's happening to the value of key objects and variables such as `weekday`.

4. Add output expressions by inserting `@weekday` as shown in the two places indicated by comments in the code. These output expressions will display the values of the variable at that point in the code execution.

```
 var weekday = DateTime.Now.DayOfWeek;
// Display the initial value of weekday.
@weekday

// As a test, add 1 day to the current weekday.
if(weekday.ToString() != "Saturday") {
    // If weekday is not Saturday, simply add one day.
    weekday = weekday + 1;
}
else {
    // If weekday is Saturday, reset the day to 0, or Sunday.
    weekday = 0;
}

// Display the updated test value of weekday.
@weekday

// Convert weekday to a string value for the switch statement.
var weekdayText = weekday.ToString();
```

5. Save and run the page in a browser.

The page displays the real day of the week first, then the updated day of the week that results from adding one day, and then the resulting message from the `switch` statement. The output from the two variable expressions (`@weekday`) have no spaces between them because you didn't add any HTML `<p>` tags to the output; the expressions are just for testing.



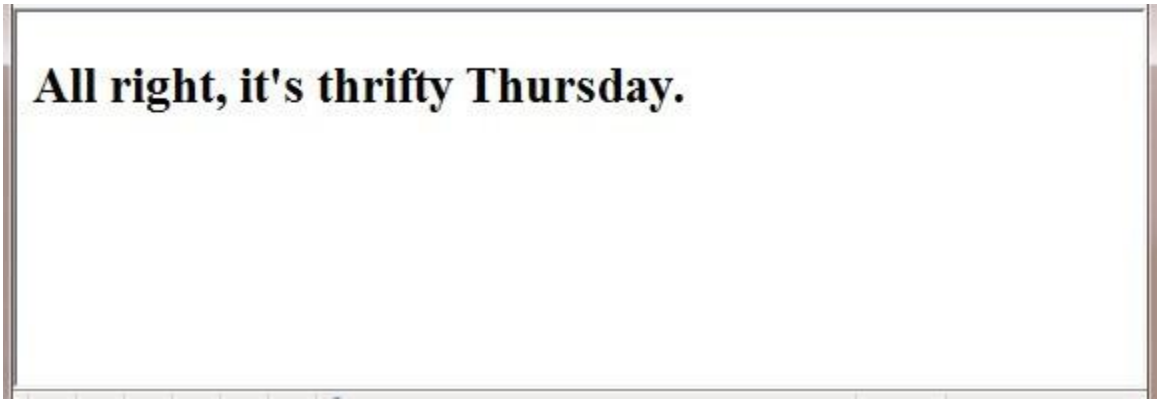
Now you can see where the error is. When you first display the `weekday` variable in the code, it shows the correct day. When you display it the second time, after the `if` block in the code, the day is off by one, so you know that something has happened between the first and second appearance of the weekday variable. If this were a real bug, this kind of approach would help you narrow down the location of the code that's causing the problem.

6. Fix the code in the page by removing the two output expressions you added, and removing the code that changes the day of the week. The remaining, complete block of code looks like the following example:

```
@{
    var weekday = DateTime.Now.DayOfWeek;
    var weekdayText = weekday.ToString();

    var greeting = "";

    switch(weekdayText)
    {
        case "Monday":
            greeting = "Ok, it's a marvelous Monday.";
            break;
        case "Tuesday":
            greeting = "It's a tremendous Tuesday.";
            break;
        case "Wednesday":
            greeting = "Wild Wednesday is here!";
            break;
        case "Thursday":
            greeting = "All right, it's thrifty Thursday.";
            break;
        case "Friday":
            greeting = "It's finally Friday!";
            break;
        case "Saturday":
            greeting = "Another slow Saturday is here.";
```

```
            break;
        case "Sunday":
            greeting = "The best day of all: serene Sunday.";
            break;
        default:
            break;
    }
}
```

7. Run the page in a browser. This time you see the correct message displayed for the actual day of the week.



Using the ObjectInfo Helper to Display Object Values

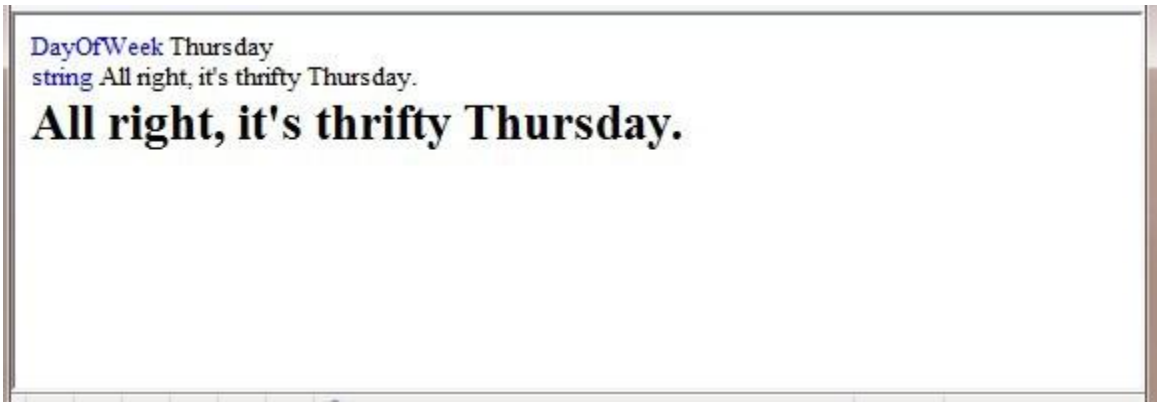
The `ObjectInfo` helper displays the type and the value of each object you pass to it. You can use it to view the value of variables and objects in your code (like you did with output expressions in the previous example), plus you can see data type information about the object.

1. Open the file named *OutputExpression.cshtml* that you created earlier.
2. Replace all code in the page with the following block of code:

```
<!DOCTYPE html>
<html>
    <head>
        <title></title>
    </head>
    <body>
    @{
      var weekday = DateTime.Now.DayOfWeek;
      @ObjectInfo.Print(weekday)
      var weekdayText = weekday.ToString();

      var greeting = "";

      switch(weekdayText)
      {
          case "Monday":
              greeting = "Ok, it's a marvelous Monday.";
              break;
```

```
            case "Tuesday":
                greeting = "It's a tremendous Tuesday.";
                break;
            case "Wednesday":
                greeting = "Wild Wednesday is here!";
                break;
            case "Thursday":
                greeting = "All right, it's thrifty Thursday.";
                break;
            case "Friday":
                greeting = "It's finally Friday!";
                break;
             case "Saturday":
                greeting = "Another slow Saturday is here.";
                break;
             case "Sunday":
                greeting = "The best day of all: serene Sunday.";
                break;
            default:
                break;
        }
    }
    @ObjectInfo.Print(greeting)
    <h2>@greeting</h2>

    </body>
</html>
```

3. Save and run the page in a browser.



In this example, the `ObjectInfo` helper displays two items:

- The type. For the first variable, the type is `DayOfWeek`. For the second variable, the type is `String`.
- The value. In this case, because you already display the value of the greeting variable in the page, the value is displayed again when you pass the variable to `ObjectInfo`.

For more complex objects, the `ObjectInfo` helper can display more information — basically, it can display the types and values of all of an object's properties.

Using Debugging Tools

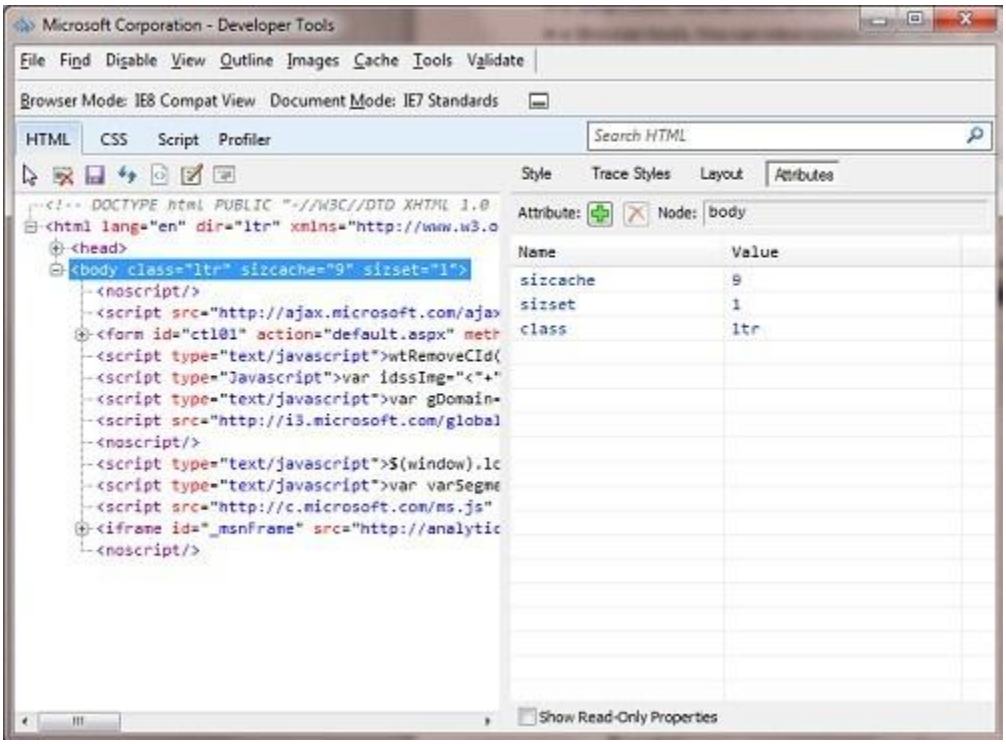
In addition to displaying information in the page to help you debug, you can use tools that provide information about how your pages are running. This section shows you how to use the most popular diagnostic tools for web pages, and how to use some tools in WebMatrix that also can help you debug your site.

Internet Explorer Developer Tools

Internet Explorer Developer Tools is a package of web tools built into Internet Explorer 8. (For previous versions of Internet Explorer, you can install the tools from the Internet Explorer Developer Toolbar page on the Microsoft Download Center.) This tool does not specifically let you debug ASP.NET code, but can be very useful for debugging HTML, CSS, and script, including the markup and script that's generated dynamically by ASP.NET.

This procedure gives you an idea of how to work with the Internet Explorer Developer Tools. It assumes you're working with Internet Explorer 8.

1. In Internet Explorer, browse to a public web page such as *www.microsoft.com*.
2. In the **Tools** menu, click **Developer Tools**.
3. Click the **HTML** tab, open the `<html>` element, and then open the `<body>` element. The window shows you all the tags in the `<body>` element.
4. In the right-hand pane, click the **Attributes** tab to see the attributes for the `<body>` tag:



5. In the right-hand pane, click **Style** to see the CSS styles that apply to the body section of the page.

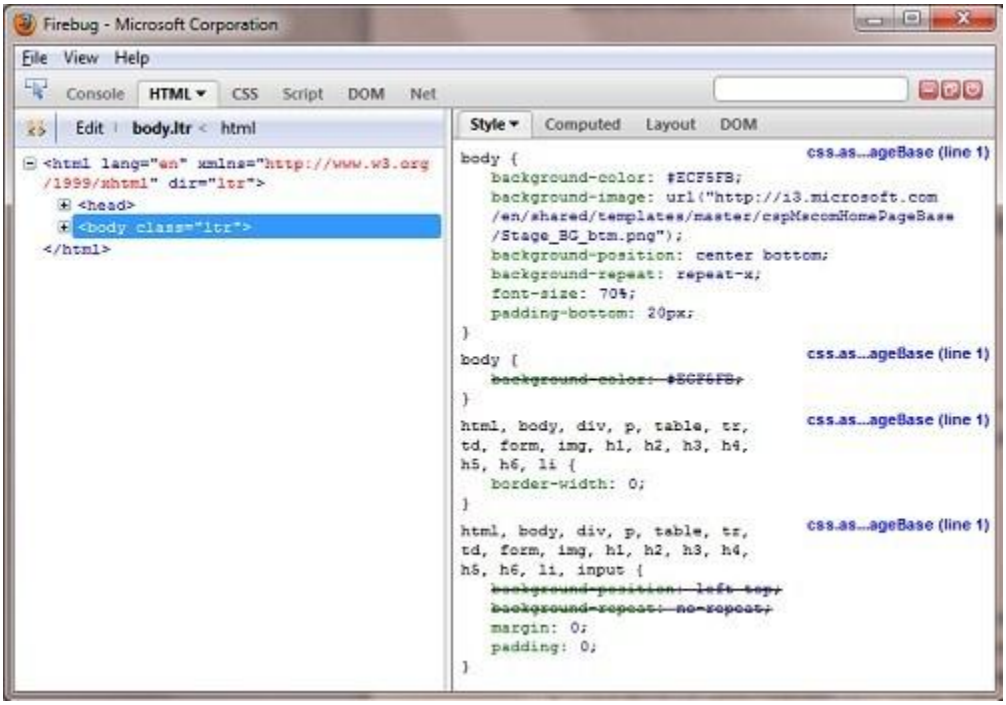
   To learn more the Internet Explorer Developer Tools, see Discovering the Internet Explorer Developer Tools on the MSDN website.

Firebug

Firebug is an add-on for Mozilla Firefox that lets you inspect HTML markup and CSS, debug client script, and view cookies and other page information. You can install Firebug from the Firebug website (*http://getfirebug.com/*). As with the Internet Explorer debugging tools, this tool does not specifically let you debug ASP.NET code, but can be very useful for examining the HTML and other page elements, including those that ASP.NET generates dynamically.

This procedure shows you a few of the things you can do with Firebug after you've installed it.

1. In Firebox, browse to *www.microsoft.com*.
2. In the **Tools** menu, click **Firebug**, and then click **Open Firebug in New Window**.
3. In the Firebug main window, click the **HTML** tab and then expand the `<html>` node in the left pane.
4. Select the `<body>` tag, and then click the **Style** tab in the right pane. Firebug displays style information about the Microsoft site.



Firebug includes many options for editing and validating your HTML and CSS styles, and for debugging and improving your script. In the **Net** tab, you can analyze the network traffic between a server and a web page. For example, you can profile your page and see how long it

takes to download all the content to a browser. To learn more about Firebug, see the Firebug main site and the Firebug Documentation Wiki.

Additional Resources

MSDN Online Documentation

- IIS Server Variables

Debugging with Visual Studio

- Appendix – Programming ASP.NET Web Pages in Visual Studio

TechNet Online Documentation

- Recognized Environment Variables

Internet Explorer Developer Tools

- Discovering the Internet Explorer Developer Tools
- Download the IE Developer Tools (Internet Explorer versions earlier than version 8)
- Debugging HTML and CSS with the Developer Tools
- Debugging Script with the Developer Tools

Firebug Add-on for Web Developers

- Firebug main site
- Firebug Documentation Wiki

Chapter 18 – Customizing Site-Wide Behavior

This chapter explains how to make settings to your entire website or an entire folder, rather than just a page.

What you'll learn

- How to run code that lets you set values (global values or helper settings) for all pages in a site.
- How to run code that lets you set values for all pages in a folder.
- How to run code before and after a page loads.
- How to send errors to a central error page.
- How to add authentication to all pages in a folder.
- How ASP.NET uses routing to let you use more readable and searchable URLs.

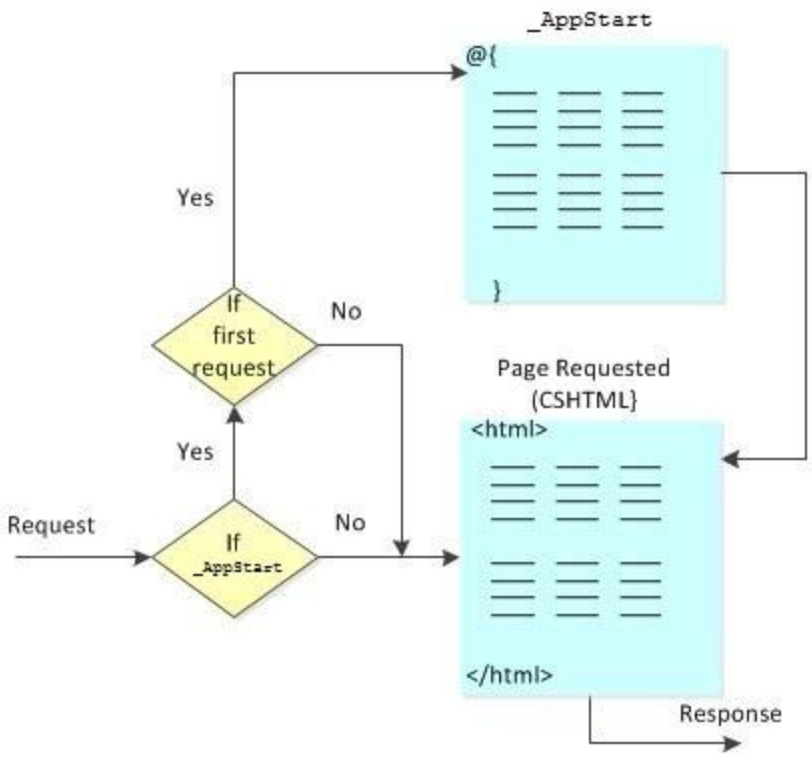
Adding Website Startup Code

Most of the code you write and the settings you make are in individual pages. For example, if a page sends an email message, the page typically contains all the code that's needed in order to initialize the settings for sending email (that is, for the SMTP server) and for sending the email message.

However, in some situations, you might want to run some code before any page on the site runs. This is useful for setting values that can be used anywhere in the site (referred to as *global values*.) Some helpers require you to provide values like email settings or account keys, for example, and it can be handy to keep these settings in global values.

You can do this by creating a page named *_AppStart.cshtml* in the root of the site. If this page exists, it runs the first time any page in the site is requested. Therefore, it's a good place to run code to set global values. (Because *_AppStart.cshtml* has an underscore prefix, ASP.NET won't send the page to a browser even if users request it directly.)

The following diagram shows how the *_AppStart.cshtml* page works. When a request comes in for a page, and if this is the first request for any page in the site, ASP.NET first checks whether a *_AppStart.cshtml* page exists. If so, any code in the *_AppStart.cshtml* page runs, and then the requested page runs.



Setting Global Values for Your Website

1. In the root folder of a WebMatrix website, create a file named *_AppStart.cshtml*. The file must be in the root of the site.
2. Replace the default markup and code with the following:

```
@{
  AppState["customAppName"] = "Application Name";
}
```

This code stores a value in the `AppState` dictionary, which is automatically available to all pages in the site.

> **Note** Be careful when you put code in the *_AppStart.cshtml* file. If any errors occur in code in the *_AppStart.cshtml* file, the website won't start.

3. In the root folder, create a new page named *AppName.cshtml*.
4. Replace the default markup and code with the following:

```
<!DOCTYPE html>
<html>
    <head>
        <title>Show Application Name</title>
    </head>
    <body>
        <h1>@AppState["customAppName"]</h1>
```

```
    </body>
</html>
```

This code extracts the value from the `AppState` object that you set in the *_AppStart.cshtml* page.

5. Run the *AppName.cshtml* page in a browser. (Make sure the page is selected in the **Files** workspace before you run it.) The page displays the global value.

Setting Values for Helpers

A good use for the *_AppStart.cshtml* file is to set values for helpers that you use in your site and that have to be initialized. A perfect example is the `ReCaptcha` helper, which requires you to specify public and private keys for your reCAPTCHA account. Instead of setting these keys on each page where you want to use the `ReCaptcha` helper, you can set them once in the *_AppStart.cshtml* and then they're already set for all the pages in your site. Other values you can set in the *_AppStart.cshtml* are settings for sending email using an SMTP server, as you saw in Chapter 16 - Adding Security and Membership.

This procedure shows you how to set the **ReCaptcha** keys globally. (For more information about using the `ReCaptcha` helper, see Chapter 16 - Adding Security and Membership.)

1. Add the ASP.NET Web Helpers Library to your website as described in Chapter 1 - Getting Started with ASP.NET Web Pages, if you haven't already added it.
2. If you haven't already, register your website at ReCaptcha.Net (http://recaptcha.net). When you've completed registration, you'll get a public key and a private key.
3. If you don't already have a *_AppStart.cshtml* file, in the root folder of a website create a file named *_AppStart.cshtml*.
4. Replace the existing code in the *_AppStart.cshtml* file with the following code:

```
@{
  // Add the PublicKey and PrivateKey strings with your public
  // and private keys. Obtain your PublicKey and PrivateKey
  // at the ReCaptcha.Net (http://recaptcha.net) website.
  ReCaptcha.PublicKey = "";
  ReCaptcha.PrivateKey = "";
```

```
}
```

5. Set the `PublicKey` and `PrivateKey` properties using your own public and private keys.
6. Save the *_AppStart.cshtml* file and close it.
7. In the root folder of a website, create new page named *Recaptcha.cshtml*.
8. Replace the default markup and code with the following:

```
@{
  var showRecaptcha = true;
  if (IsPost) {
    if (ReCaptcha.Validate()) {
        @:Your response passed!
        showRecaptcha = false;
    }
    else{
      @:Your response didn't pass!
    }
  }
}
<!DOCTYPE html>
<html>
    <head>
        <title>Testing Global Recaptcha Keys</title>
    </head>
    <body>
    <form action="" method="post">
    @if(showRecaptcha == true){
        if(ReCaptcha.PrivateKey != ""){
            <p>@ReCaptcha.GetHtml()</p>
            <input type="submit" value="Submit" />
        }
        else {
            <p>You can get your public and private keys at
            the ReCaptcha.Net website (http://recaptcha.net).
            Then add the keys to the _AppStart.cshtml file.</p>
        }
    }
    </form>
    </body>
</html>
```

9. Run the *Recaptcha.cshtml* page in a browser. If the `PrivateKey` value is valid, the page displays the reCAPTCHA control and a button. If you had not set the keys globally in *_AppStart.html*, the page would display an error.

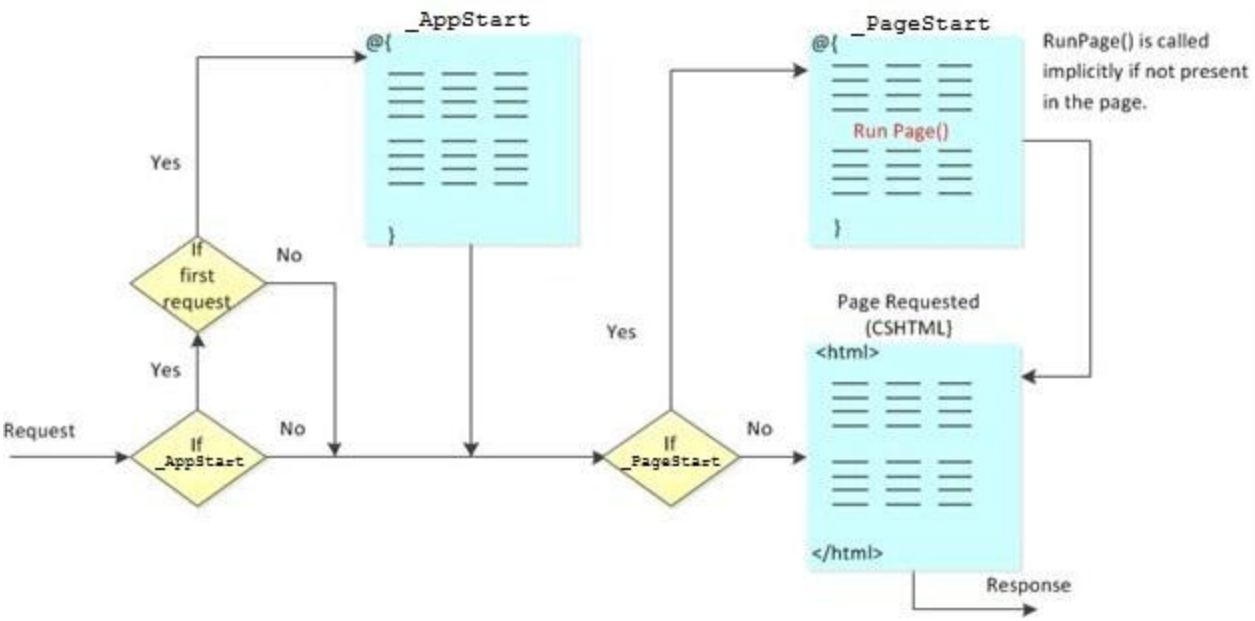
10. Enter the words for the test. If you pass the reCAPTCHA test, you see a message to that effect; otherwise you see an error message and the reCAPTCHA control is redisplayed.

Running Code Before and After Files in a Folder

Just like you can use *_AppStart.cshtml* to write code before pages in the site run, you can write code that runs before (and after) any page in a particular folder run. This is useful for things like setting the same layout page for all the pages in a folder, or for checking that a user is logged in before running a page in the folder.

For pages in particular folders, you can create code in a file named *_PageStart.cshtml*. The following diagram shows how the *_PageStart.cshtml* page works. When a request comes in for a page, ASP.NET first checks for a *_AppStart.cshtml* page and runs that. Then ASP.NET checks whether there's an *_PageStart.cshtml* page, and if so, runs that. It then runs the requested page.

Inside the *_PageStart.cshtml* page, you can specify where during processing you want the requested page to run by including a `RunPage` method. This lets you run code before the requested page runs and then again after it. If you don't include `RunPage`, all the code in *_PageStart.cshtml* runs, and then the requested page runs automatically.



ASP.NET lets you create a hierarchy of *_PageStart.cshtml* files. You can put an *_PageStart.cshtml* file in the root of the site and in any subfolder. When a page is requested, the *_PageStart.cshtml* file at the top-most level (nearest to the site root) runs, followed by the *_PageStart.cshtml* file in the next subfolder, and so on down the subfolder structure until the request reaches the folder that contains the requested page. After all the applicable *_PageStart.cshtml* files have run, the requested page runs.

For example, you might have the following combination of *_PageStart.cshtml* files and *default.cshtml* file:

```
@* ~/_PageStart.cshtml *@
@{
  PageData["Color1"] = "Red";
  PageData["Color2"] = "Blue";
}


@* ~/myfolder/_PageStart.cshtml *@
@{
  PageData["Color2"] = "Yellow";
  PageData["Color3"] = "Green";
}


@* ~/myfolder/default.cshtml *@
@PageData["Color1"]
<br/>
@PageData["Color2"]
<br/>
@PageData["Color3"]
```

When you run *default.cshtml*, you'll see the following:

```
Red

Yellow

Green
```

Running Initialization Code for All Pages in a Folder

A good use for *_PageStart.cshtml* files is to initialize the same layout page for all files in a single folder.

1. In the root folder, create a new folder named *InitPages*.
2. In the *InitPages* folder of your website, create a file named *_PageStart.cshtml* and replace the default markup and code with the following:

```
@{
    // Sets the layout page for all pages in the folder.
    Layout = "~/Shared/_Layout1.cshtml";

    // Sets a variable available to all pages in the folder.
    PageData["MyBackground"] = "Yellow";
}
```

3. In the root of the website, create a folder named *Shared*.
4. In the *Shared* folder, create a file named *_Layout1.cshtml* and replace the default markup and code with the following:

```
@{
  var backgroundColor = PageData["MyBackground"];
}
<!DOCTYPE html>
<html>
<head>
  <title>Page Title</title>
  <link type="text/css" href="/Styles/Site.css" rel="stylesheet" />
</head>
<body>
  <div id="header">
    Using the _PageStart.cshtml file
  </div>
  <div id="main" style="background-color:@backgroundColor">
    @RenderBody()
  </div>
<div id="footer">
  &copy; 2010 Contoso. All rights reserved
</div>
</body>
</html>
```

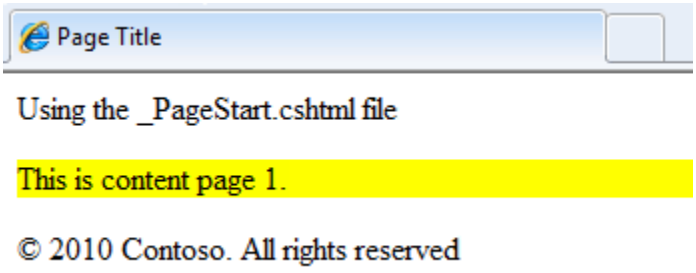
5. In the *InitPages* folder, create a file named *Content1.cshtml* and replace the default markup with the following:

```
<p>This is content page 1.</p>
```

6. In the *InitPages* folder, create another file named *Content2.cshtml* and replace the default markup with the following:

```
<p>This is content page 2.</p>
```

7. Run *Content1.cshtml* in a browser.



When the *Content1.cshtml* page runs, the *_PageStart.cshtml* file sets `Layout` and also sets `PageData["MyBackground"]` to a color. In *Content1.cshtml*, the layout and color are applied.

8. Display *Content2.cshtml* in a browser.

The layout is the same, because both pages use the same layout page and color as initialized in *_PageStart.cshtml*.

Using _PageStart.cshtml to Handle Errors

Another good use for the *_PageStart.cshtml* file is to create a way to handle programming errors (exceptions) that might occur in any *.cshtml* page in a folder. This example shows you one way to do this.

1. In the root folder, create a folder named *InitCatch*.
2. In the *InitCatch* folder of your website, create a file named *_PageStart.cshtml* and replace the existing markup and code with the following:

```
@{
    try
    {
        RunPage();
    }
    catch (Exception ex)
    {
        Response.Redirect("~/Error.cshtml?source=" +
            HttpUtility.UrlEncode(Request.AppRelativeCurrentExecutionFilePath));
    }
}
```

In this code, you try running the requested page explicitly by calling the `RunPage` method inside a `try` block. If any programming errors occur in the requested page, the code inside the `catch`

block runs. In this case, the code redirects to a page (*Error.cshtml*) and passes the name of the file that experienced the error as part of the URL. (You'll create the page shortly.)

3. In the *InitCatch* folder of your website, create a file named *Exception.cshtml* and replace the existing markup and code with the following:

```
@{
    var db = Database.Open("invalidDatabaseFile");
}
```

For purposes of this example, what you're doing in this page is deliberately creating an error by trying to open a database file that doesn't exist.

4. In the root folder, create a file named *Error.cshtml* and replace the existing markup and code with the following:

```
<!DOCTYPE html>
<html>
    <head>
        <title>Error Page</title>
    </head>
    <body>
<h1>Error report</h1>
<p>An error occurred while running the following file: @Request["source"]</p>
    </body>
</html>
```

In this page, the expression `@Request["source"]` gets the value out of the URL and displays it.

5. In the toolbar, click **Save**.
6. Run *Exception.cshtml* in a browser.

Because an error occurs in *Exception.cshtml*, the *_PageStart.cshtml* page redirects to the *Error.cshtml* file, which displays the message.

For more information about exceptions, see Chapter 2 – Introduction to ASP.NET Web Programming Using the Razor Syntax.

Using _PageStart.cshtml to Restrict Folder Access

You can also use the *_PageStart.cshtml* file to restrict access to all the files in a folder.

1. Create a new website using the **Site From Template** option.
2. From the available templates, select **Starter Site**.
3. In the root folder, create a folder named *AuthenticatedContent*.
4. In the *AuthenticatedContent* folder, create a file named *_PageStart.cshtml* and replace the existing markup and code with the following:

```
@{
    Response.CacheControl = "no-cache";

    if (!WebSecurity.IsAuthenticated) {
        Response.Redirect("~/Account/Login");
    }
}
```

   The code starts by preventing all files in the folder from being cached. (This is required for scenarios like public computers, where you don't want one user's cached pages to be available to the next user.) Next, the code determines whether the user has signed in to the site before they can view any of the pages in the folder. If the user is not signed in, the code redirects to the login page.

5. Create a new page in the *AuthenticatedContent* folder named *Page.cshtml*.
6. Replace the default markup with the following:

```
@{
    Layout = "~/_SiteLayout.cshtml";
    Page.Title = "Authenticated Content";
}
<!DOCTYPE html>
<html>
  <head>
    <meta charset="utf-8" />
  </head>
  <body>
    Thank you for authenticating!
  </body>
</html>
```

7. Run *Page.cshtml* in a browser. The code redirects you to a login page. You must register before logging in. After you've registered and logged in, you can navigate to the page and view its contents.

Creating More Readable and Searchable URLs

The URLs for the pages in your site can have an impact on how well the site works. A URL that's "friendly" can make it easier for people to use the site. It can also help with search-engine optimization (SEO) for the site. ASP.NET websites include the ability to use friendly URLs automatically.

About Routing

ASP.NET lets you create meaningful URLs that describe user actions instead of just pointing to a file on the server. Compare these pairs of URLs for a fictional blog:

http://www.contoso.com/Blog/blog.cshtml?categories=hardware
http://www.contoso.com//Blog/blog.cshtml?startdate=2009-11-01&enddate=2009-11-30

http://www.contoso.com/Blog/categories/hardware/
http://www.contoso.com/Blog/2009/November

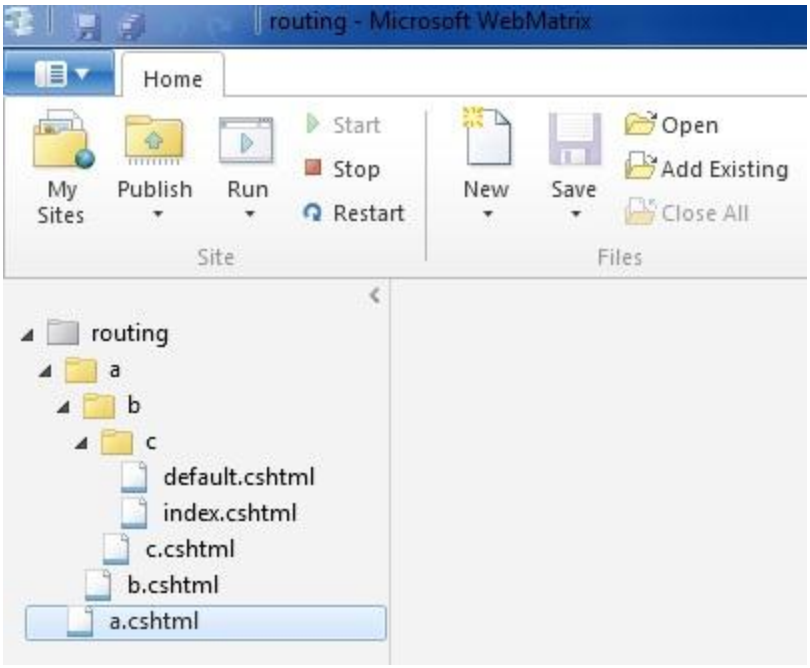
In the first pair, a user would have to know that the blog is displayed using the *blog.cshtml* page, and would then have to construct a query string that gets the right category or date range. The second set of examples is much easier to comprehend and create.

The URLs for the first example also point directly to a specific file (*blog.cshtml*). If for some reason the blog were moved to another folder on the server, or if the blog were rewritten to use a different page, the links would be wrong. The second set of URLs doesn't point to a specific page, so even if the blog implementation or location changes, the URLs would still be valid.

In ASP.NET, you can create friendlier URLs like those in the above examples because ASP.NET uses *routing*. Routing creates logical mapping from a URL to a page (or pages) that can fulfill the request. Because the mapping is logical (not physical, to a specific file), routing provides great flexibility in how you define the URLs for your site.

How Routing Works

When ASP.NET processes a request, it reads the URL to determine how to route it. ASP.NET tries to match individual segments of the URL to files on disk, going from left to right. If there's a match, anything remaining in the URL is passed to the page as *path information*. For example, imagine the following folder structure in a website:



And imagine that someone makes a request using this URL:

http://www.contoso.com/a/b/c

The search goes like this:

1. Is there a file with the path and name of */a/b/c.cshtml*? If so, run and pass no information. Otherwise ...
2. Is there a file with the path and name of */a/b.cshtml*? If so, use that and pass it the information c to it. Otherwise …
3. Is there a file with the path and name of */a.cshtml*? If so, run that page and pass the information *b/c* to it.

If the search found no exact matches for *.cshtml* files in their specified folders, ASP.NET continues looking for these files in turn:

4. */a/b/c/default.cshtml* (no path information).
5. */a/b/c/index.cshtml* (no path information).

> **Note** To be clear, requests for specific pages (that is, requests that include the *.cshtml* filename extension) work just like you'd expect. A request like *http://www.contoso.com/a/b.cshtml* will run the page *b.cshtml* just fine.

Inside a page, you can get the path information via the page's `UrlData` property, which is a dictionary. Imagine that you have a file named *ViewCustomers.cshtml* and your site gets this request:

http://mysite.com/myWebSite/ViewCustomers/1000

As described in the rules above, the request will go to your page. Inside the page, you can use code like the following to get and display the path information (in this case, the value "1000"):

```
<!DOCTYPE html>
<html>
    <head>
        <title>URLData</title>
    </head>
    <body>
      Customer ID: @UrlData[0].ToString()
    </body>
</html>
```

> **Note** Because routing doesn't involve complete file names, there can be ambiguity if you have pages that have the same name but different file-name extensions (for example, *MyPage.cshtml* and *MyPage.html*). In order to avoid problems with routing, it's best to make sure that you don't have pages in your site whose names differ only in their extension.

Additional Resources

- ASP.NET Web Pages with Razor Syntax Reference

Appendix – ASP.NET Quick API Reference

This page contains a list with brief examples of the most commonly used objects, properties, and methods for programming ASP.NET Web Pages with Razor syntax.

For API reference documentation, see the ASP.NET Web Pages Reference Documentation on MSDN.

This appendix contains reference information for the following:

Classes

`AsBool(), AsBool(true|false)`

Converts a string value to a Boolean value (true/false). Returns false or the specified value if the string does not represent true/false.

```
bool b = stringValue.AsBool();
```

`AsDateTime(), AsDateTime(value)`

Converts a string value to date/time. Returns `DateTime.MinValue` or the specified value if the string does not represent a date/time.

```
DateTime dt = stringValue.AsDateTime();
```

`AsDecimal(), AsDecimal(value)`

Converts a string value to a decimal value. Returns 0.0 or the specified value if the string does not represent a decimal value.

```
decimal d = stringValue.AsDecimal();
```

`AsFloat(), AsFloat(value)`

Converts a string value to a float. Returns 0.0 or the specified value if the string does not represent a decimal value.

```
float d = stringValue.AsFloat();
```

`AsInt(), AsInt(value)`

Converts a string value to an integer. Returns 0 or the specified value if the string does not represent an integer.

```
int i = stringValue.AsInt();
```

```
Href(path [, param1 [, param2]])
```

Creates a browser-compatible URL from a local file path, with optional additional path parts.

```
<a href="@Href("~/Folder/File")">Link to My File</a>
<a href="@Href("~/Product", "Tea")">Link to Product</a>
```

```
Html.Raw(value)
```

Renders *value* as HTML markup instead of rendering it as HTML-encoded output.

```
@* Inserts markup into the page. *@
@Html.Raw("<div>Hello <em>world</em>!</div>")
```

```
IsBool(), IsDateTime(), IsDecimal(), IsFloat(), IsInt()
```

Returns true if the value can be converted from a string to the specified type.

```
var isint = stringValue.IsInt();
```

```
IsEmpty()
```

Returns true if the object or variable has no value.

```
if (Request["companyname"].IsEmpty()) {
   @:Company name is required.<br />
}
```

```
IsPost
```

Returns true if the request is a POST. (Initial requests are usually a GET.)

```
if (IsPost) { Response.Redirect("Posted"); }
```

```
Layout
```

Specifies the path of a layout page to apply to this page.

```
Layout = "_MyLayout.cshtml";
```

```
PageData[key], PageData[index], Page
```

Contains data shared between the page, layout pages, and partial pages in the current request. You can use the dynamic `Page` property to access the same data, as in the following example:

```
PageData["FavoriteColor"] = "red";
PageData[1] = "apples";
Page.MyGreeting = "Good morning";
```

```
// Displays the value assigned to PageData[1] in the page.
@Page[1]
// Displays the value assigned to Page.MyGreeting.
@Page.MyGreeting
```

```
RenderBody()
```

(Layout pages) Renders the content of a content page that is not in any named sections.

```
@RenderBody()
```

```
RenderPage(path, values)
RenderPage(path[, param1 [, param2]])
```

Renders a content page using the specified path and optional extra data. You can get the values of the extra parameters from `PageData` by position (example 1) or key (example 2).

```
RenderPage("_MySubPage.cshtml", "red", 123, "apples")
RenderPage("_MySubPage.cshtml", new { color = "red", number = 123, food = "apples" })
```

```
RenderSection(sectionName [, required = true|false])
```

(Layout pages) Renders a content section that has a name. Set *required* to false to make a section optional.

```
@RenderSection("header")
```

```
Request.Cookies[key]
```

Gets or sets the value of an HTTP cookie.

```
var cookieValue = Request.Cookies["myCookie"].Value;
```

```
Request.Files[key]
```

Gets the files that were uploaded in the current request.

```
Request.Files["postedFile"].SaveAs(@"MyPostedFile");
```

```
Request.Form[key]
```

Gets data that was posted in a form (as strings). `Request[key]` checks both the `Request.Form` and the `Request.QueryString` collections.

```
var formValue = Request.Form["myTextBox"];
// This call produces the same result.
var formValue = Request["myTextBox"];
```

```
Request.QueryString[key]
```

Gets data that was specified in the URL query string. `Request[key]` checks both the `Request.Form` and the `Request.QueryString` collections.

```
var queryValue = Request.QueryString["myTextBox"];
// This call produces the same result.
var queryValue = Request["myTextBox"];
```

```
Request.Unvalidated(key)
Request.Unvalidated().QueryString|Form|Cookies|Headers[key]
```

Selectively disables request validation for a form element, query-string value, cookie, or header value. Request validation is enabled by default and prevents users from posting markup or other potentially dangerous content.

```
// Call the method directly to disable validation on the specified item from one of the
Request collections.
Request.Unvalidated("userText");

// You can optionally specify which collection the value is from.
var prodID = Request.Unvalidated().QueryString["productID"];
var richtextValue = Request.Unvalidated().Form["richTextBox1"];
var cookie = Request.Unvalidated().Cookies["mostRecentVisit"];
```

```
Response.AddHeader(name, value)
```

Adds an HTTP server header to the response.

```
// Adds a header that requests client browsers to use basic authentication.
Response.AddHeader("WWW-Authenticate", "BASIC");
```

```
Response.OutputCache(seconds [, sliding] [, varyByParams])
```

Caches the page output for a specified time. Optionally set *sliding* to reset the timeout on each page access and *varyByParams* to cache different versions of the page for each different query string in the page request.

```
Response.OutputCache(60);
Response.OutputCache(3600, true);
Response.OutputCache(10, varyByParams : new[] {"category","sortOrder"});
```

```
Response.Redirect(path)
```

Redirects the browser request to a new location.

```
Response.Redirect("~/Folder/File");
```

```
Response.SetStatus(httpStatusCode)
```

Sets the HTTP status code sent to the browser.

```
Response.SetStatus(HttpStatusCode.Unauthorized);
Response.SetStatus(401);
```

```
Response.WriteBinary(data [, mimetype])
```

Writes the contents of *data* to the response with an optional MIME type.

```
Response.WriteBinary(image, "image/jpeg");
```

```
Response.WriteFile(file)
```

Writes the contents of a file to the response.

```
Response.WriteFile("file.ext");
```

```
@section(sectionName) { content }
```

(Layout pages) Defines a content section that has a name.

```
@section header { <div>Header text</div> }
```

```
Server.HtmlDecode(htmlText)
```

Decodes a string that is HTML encoded.

```
var htmlDecoded = Server.HtmlDecode("&lt;html&gt;");
```

```
Server.HtmlEncode(text)
```

Encodes a string for rendering in HTML markup.

```
var htmlEncoded = Server.HtmlEncode("<html>");
```

```
Server.MapPath(virtualPath)
```

Returns the server physical path for the specified virtual path.

```
var dataFile = Server.MapPath("~/App_Data/data.txt");
```

```
Server.UrlDecode(urlText)
```

Decodes text from a URL.

```
var urlDecoded = Server.UrlDecode("url%20data");
```

```
Server.UrlEncode(text)
```

Encodes text to put in a URL.

```
var urlEncoded = Server.UrlEncode("url data");
```

```
Session[key]
```

Gets or sets a value that exists until the user closes the browser.

```
Session["FavoriteColor"] = "red";
```

```
ToString()
```

Displays a string representation of the object's value.

```
<p>It is now @DateTime.Now.ToString()</p>
```

```
UrlData[index]
```

Gets additional data from the URL (for example, */MyPage/ExtraData*).

```
var pathInfo = UrlData[0];
```

```
WebSecurity.ChangePassword(userName, currentPassword, newPassword)
```

Changes the password for the specified user.

```
var success = WebSecurity.ChangePassword("my-username","current-password", "new-password");
```

```
WebSecurity.ConfirmAccount(accountConfirmationToken)
```

Confirms an account using the account confirmation token.

```
var confirmationToken = Request.QueryString["ConfirmationToken"];
if(WebSecurity.ConfirmAccount(confirmationToken)) {
      //...
}
```

```
WebSecurity.CreateAccount(userName, password
  [, requireConfirmationToken = true|false])
```

Creates a new user account with the specified user name and password. To require a confirmation token, pass true for *requireConfirmationToken.*

```
WebSecurity.CreateAccount("my-username", "secretpassword");
```

```
WebSecurity.CurrentUserId
```

Gets the integer identifier for the currently logged-in user.

```
var userId = WebSecurity.CurrentUserId;
```

```
WebSecurity.CurrentUserName
```

Gets the name for the currently logged-in user.

```
var welcome = "Hello " + WebSecurity.CurrentUserName;
```

```
WebSecurity.GeneratePasswordResetToken(username
  [, tokenExpirationInMinutesFromNow])
```

Generates a password-reset token that can be sent in email to a user so that the user can reset the password.

```
var resetToken = WebSecurity.GeneratePasswordResetToken("my-username");
var message = "Visit http://example.com/reset-password/" + resetToken +
```

```
    " to reset your password";
WebMail.Send(..., message);
```

```
WebSecurity.GetUserId(userName)
```

Returns the user ID from the user name.

```
var userId = WebSecurity.GetUserId(userName);
```

```
WebSecurity.IsAuthenticated
```

Returns true if the current user is logged in.

```
if(WebSecurity.IsAuthenticated) {...}
```

```
WebSecurity.IsConfirmed(userName)
```

Returns true if the user has been confirmed (for example, through a confirmation email).

```
if(WebSecurity.IsConfirmed("joe@contoso.com")) { ... }
```

```
WebSecurity.IsCurrentUser(userName)
```

Returns true if the current user's name matches the specified user name.

```
if(WebSecurity.IsCurrentUser("joe@contoso.com")) { ... }
```

```
WebSecurity.Login(userName, password[, persistCookie])
```

Logs the user in by setting an authentication token in the cookie.

```
if(WebSecurity.Login("username", "password")) { ... }
```

```
WebSecurity.Logout()
```

Logs the user out by removing the authentication token cookie.

```
WebSecurity.Logout();
```

```
WebSecurity.RequireAuthenticatedUser()
```

If the user is not authenticated, sets the HTTP status to 401 (Unauthorized).

```
WebSecurity.RequireAuthenticatedUser();
```

```
WebSecurity.RequireRoles(roles)
```

If the current user is not a member of one of the specified roles, sets the HTTP status to 401 (Unauthorized).

```
WebSecurity.RequireRoles("Admin", "Power Users");
```

```
WebSecurity.RequireUser(userId)
```

```
WebSecurity.RequireUser(userName)
```

If the current user is not the user specified by *username*, sets the HTTP status to 401 (Unauthorized).

```
WebSecurity.RequireUser("joe@contoso.com");
```

```
WebSecurity.ResetPassword(passwordResetToken, newPassword)
```

If the password reset token is valid, changes the user's password to the new password.

```
WebSecurity.ResetPassword( "A0F36BFD9313", "new-password")
```

Data

```
Database.Execute(SQLstatement [, parameters]
```

Executes *SQLstatement* (with optional parameters) such as INSERT, DELETE, or UPDATE and returns a count of affected records.

```
db.Execute("INSERT INTO Data (Name) VALUES ('Smith')");

db.Execute("INSERT INTO Data (Name) VALUES (@0)", "Smith");
```

```
Database.GetLastInsertId()
```

Returns the identity column from the most recently inserted row.

```
db.Execute("INSERT INTO Data (Name) VALUES ('Smith')");
var id = db.GetLastInsertId();
```

```
Database.Open(filename)
Database.Open(connectionStringName)
```

Opens either the specified database file or the database specified using a named connection string from the *Web.config* file.

```
// Note that no filename extension is specified.
var db = Database.Open("SmallBakery"); // Opens SmallBakery.sdf in App_Data
// Opens a database by using a named connection string.
var db = Database.Open("SmallBakeryConnectionString");
```

```
Database.OpenConnectionString(connectionString)
```

Opens a database using the connection string. (This contrasts with `Database.Open`, which uses a connection string name.)

```
var db = Database.OpenConnectionString("Data Source=|DataDirectory|\SmallBakery.sdf");
```

```
Database.Query(SQLstatement[, parameters])
```

Queries the database using *SQLstatement* (optionally passing parameters) and returns the results as a collection.

```
foreach (var result in db.Query("SELECT * FROM PRODUCT")) {<p>@result.Name</p>}

foreach (var result = db.Query("SELECT * FROM PRODUCT WHERE Price > @0", 20))
   { <p>@result.Name</p> }
```

`Database.QuerySingle(`*`SQLstatement [, parameters]`*`)`

Executes *SQLstatement* (with optional parameters) and returns a single record.

```
var product = db.QuerySingle("SELECT * FROM Product WHERE Id = 1");

var product = db.QuerySingle("SELECT * FROM Product WHERE Id = @0", 1);
```

`Database.QueryValue(`*`SQLstatement [, parameters]`*`)`

Executes *SQLstatement* (with optional parameters) and returns a single value.

```
var count = db.QueryValue("SELECT COUNT(*) FROM Product");

var count = db.QueryValue("SELECT COUNT(*) FROM Product WHERE Price > @0", 20);
```

Helpers

`Analytics.GetGoogleHtml(`*`webPropertyId`*`)`

Renders the Google Analytics JavaScript code for the specified ID.

```
@Analytics.GetGoogleHtml("MyWebPropertyId")
```

`Analytics.GetStatCounterHtml(`*`project, security`*`)`

Renders the StatCounter Analytics JavaScript code for the specified project.

```
@Analytics.GetStatCounterHtml(89, "security")
```

`Analytics.GetYahooHtml(`*`account`*`)`

Renders the Yahoo Analytics JavaScript code for the specified account.

```
@Analytics.GetYahooHtml("myaccount")
```

`Bing.SearchBox(`*`[boxWidth]`*`)`

Passes a search to Bing. To specify the site to search and a title for the search box, you can set the `Bing.SiteUrl` and `Bing.SiteTitle` properties. Normally you set these properties in the *_AppStart* page.

```
@Bing.SearchBox() @* Searches the web.*@
```

```
@{
   Bing.SiteUrl = "www.asp.net";  @* Limits search to the www.asp.net site. *@
}
@Bing.SearchBox()
```

```
Chart(width, height [, template] [, templatePath])
```

Initializes a chart.

```
@{
   var myChart = new Chart(width: 600, height: 400);
}
```

```
Chart.AddLegend([title] [, name])
```

Adds a legend to a chart.

```
@{
var myChart = new Chart(width: 600, height: 400)
    .AddLegend("Basic Chart")
    .AddSeries(
        name: "Employee",
        xValue: new[] {  "Peter", "Andrew", "Julie", "Mary", "Dave" },
        yValues: new[] { "2", "6", "4", "5", "3" })
    .Write();
}
```

```
Chart.AddSeries([name] [, chartType] [, chartArea]
  [, axisLabel] [, legend] [, markerStep] [, xValue]
  [, xField] [, yValues] [, yFields] [, options])
```

Adds a series of values to the chart.

```
@{
var myChart = new Chart(width: 600, height: 400)
    .AddSeries(
        name: "Employee",
        xValue: new[] {  "Peter", "Andrew", "Julie", "Mary", "Dave" },
        yValues: new[] { "2", "6", "4", "5", "3" })
    .Write();
}
```

```
Crypto.Hash(string [, algorithm])
Crypto.Hash(bytes [, algorithm])
```

Returns a hash for the specified data. The default algorithm is `sha256`.

```
@Crypto.Hash("data")
```

```
Facebook.LikeButton(href [, buttonLayout] [, showFaces] [, width] [, height]
 [, action] [, font] [, colorScheme] [, refLabel])
```

Lets Facebook users make a connection to pages.

```
@Facebook.LikeButton("www.asp.net")
```

```
FileUpload.GetHtml([initialNumberOfFiles] [, allowMoreFilesToBeAdded]
  [, includeFormTag] [, addText] [, uploadText])
```

Renders UI for uploading files.

```
@FileUpload.GetHtml(initialNumberOfFiles:1, allowMoreFilesToBeAdded:false,
  includeFormTag:true, uploadText:"Upload")
```

```
GamerCard.GetHtml(gamerTag)
```

Renders the specified Xbox gamer tag.

```
@GamerCard.GetHtml("joe")
```

```
Gravatar.GetHtml(email [, imageSize] [, defaultImage] [, rating]
  [, imageExtension] [, attributes])
```

Renders the Gravatar image for the specified email address.

```
@Gravatar.GetHtml("joe@contoso.com")
```

```
Json.Encode(object)
```

Converts a data object to a string in the JavaScript Object Notation (JSON) format.

```
var myJsonString = Json.Encode(dataObject);
```

```
Json.Decode(string)
```

Converts a JSON-encoded input string to a data object that you can iterate over or insert into a database.

```
var myJsonObj = Json.Decode(jsonString);
```

```
LinkShare.GetHtml(pageTitle [, pageLinkBack] [, twitterUserName]
  [, additionalTweetText] [, linkSites])
```

Renders social networking links using the specified title and optional URL.

```
@LinkShare.GetHtml("ASP.NET Web Pages Samples")
@LinkShare.GetHtml("ASP.NET Web Pages Samples", "http://www.asp.net")
```

```
ModelStateDictionary.AddError(key, errorMessage)
```

Associates an error message with a form field. Use the `ModelState` helper to access this member.

```
ModelState.AddError("email", "Enter an email address");
```

```
ModelStateDictionary.AddFormError(errorMessage)
```

Associates an error message with a form. Use the `ModelState` helper to access this member.

```
ModelState.AddFormError("Password and confirmation password do not match.");
```

`ModelStateDictionary.IsValid`

Returns true if there are no validation errors. Use the `ModelState` helper to access this member.

```
if (ModelState.IsValid) { // Save the form to the database }
```

`ObjectInfo.Print(value [, depth] [, enumerationLength])`

Renders the properties and values of an object and any child objects.

```
@ObjectInfo.Print(person)
```

`Recaptcha.GetHtml([, publicKey] [, theme] [, language] [, tabIndex])`

Renders the reCAPTCHA verification test.

```
@ReCaptcha.GetHtml()
```

`ReCaptcha.PublicKey`
`ReCaptcha.PrivateKey`

Sets public and private keys for the reCAPTCHA service. Normally you set these properties in the *_AppStart* page.

```
ReCaptcha.PublicKey = "your-public-recaptcha-key";
ReCaptcha.PrivateKey = "your-private-recaptcha-key";
```

`ReCaptcha.Validate([, privateKey])`

Returns the result of the reCAPTCHA test.

```
if (ReCaptcha.Validate()) {
   // Test passed.
}
```

`ServerInfo.GetHtml()`

Renders status information about ASP.NET Web Pages.

```
@ServerInfo.GetHtml()
```

`Twitter.Profile(twitterUserName)`

Renders a Twitter stream for the specified user.

```
@Twitter.Profile("billgates")
```

`Twitter.Search(searchQuery)`

Renders a Twitter stream for the specified search text.

```
@Twitter.Search("asp.net")
```

`Video.Flash(`*`filename [, width, height]`*`)`

Renders a Flash video player for the specified file with optional width and height.

```
@Video.Flash("test.swf", "100", "100")
```

`Video.MediaPlayer(`*`filename [, width, height]`*`)`

Renders a Windows Media player for the specified file with optional width and height.

```
@Video.MediaPlayer("test.wmv", "100", "100")
```

`Video.Silverlight(`*`filename, width, height`*`)`

Renders a Silverlight player for the specified *.xap* file with required width and height.

```
@Video.Silverlight("test.xap", "100", "100")
```

`WebCache.Get(`*`key`*`)`

Returns the object specified by *key*, or null if the object is not found.

```
var username = WebCache.Get("username")
```

`WebCache.Remove(`*`key`*`)`

Removes the object specified by *key* from the cache.

```
WebCache.Remove("username")
```

`WebCache.Set(`*`key, value [, minutesToCache] [, slidingExpiration]`*`)`

Puts *value* into the cache under the name specified by *key*.

```
WebCache.Set("username", "joe@contoso.com ")
```

`WebGrid(`*`data`*`)`

Creates a new `WebGrid` object using data from a query.

```
var db = Database.Open("SmallBakery");
var grid = new WebGrid(db.Query("SELECT * FROM Product"));
```

`WebGrid.GetHtml()`

Renders markup to display data in an HTML table.

```
@grid.GetHtml()// The 'grid' variable is set when WebGrid is created.
```

```
WebGrid.Pager()
```

Renders a pager for the `WebGrid` object.

```
@grid.Pager() // The 'grid' variable is set when WebGrid is created.
```

```
WebImage(path)
```

Loads an image from the specified path.

```
var image = new WebImage("test.png");
```

```
WebImage.AddImagesWatermark(image)
```

Adds the specified image as a watermark.

```
WebImage photo = new WebImage("test.png");
WebImage watermarkImage = new WebImage("logo.png");
photo.AddImageWatermark(watermarkImage);
```

```
WebImage.AddTextWatermark(text)
```

Adds the specified text to the image.

```
image.AddTextWatermark("Copyright")
```

```
WebImage.FlipHorizontal()
WebImage.FlipVertical()
```

Flips the image horizontally or vertically.

```
image.FlipHorizontal();
image.FlipVertical();
```

```
WebImage.GetImageFromRequest()
```

Loads an image when an image is posted to a page during a file upload.

```
var image = WebImage.GetImageFromRequest();
```

```
WebImage.Resize(width, height)
```

Resizes an the image.

```
image.Resize(100, 100);
```

```
WebImage.RotateLeft()
WebImage.RotateRight()
```

Rotates the image to the left or the right.

```
image.RotateLeft();
image.RotateRight();
```

```
WebImage.Save(path [, imageFormat])
```

Saves the image to the specified path.

```
image.Save("test.png");
```

```
WebMail.Password
```

Sets the password for the SMTP server. Normally you set this property in the *_AppStart* page.

```
WebMail.Password = "password";
```

```
WebMail.Send(to, subject, body [, from] [, cc] [, filesToAttach] [, isBodyHtml]
  [, additionalHeaders])
```

Sends an email message.

```
WebMail.Send("touser@contoso.com", "subject", "body of message", "fromuser@contoso.com");
```

```
WebMail.SmtpServer
```

Sets the SMTP server name. Normally you set this property in the *_AppStart* page.

```
WebMail.SmtpServer = "smtp.mailserver.com";
```

```
WebMail.UserName
```

Sets the user name for the SMTP server. Normally you should set this property in the *_AppStart* page.

```
WebMail.UserName = "Joe";
```

Appendix – ASP.NET Web Pages Visual Basic

This appendix gives you an overview of programming with ASP.NET Web pages in Visual Basic, using the Razor syntax.

In this book the ASP.NET code examples using the Razor syntax are based on C#. But the Razor syntax also supports Visual Basic. To program an ASP.NET web page in Visual Basic, you create a web page with a *.vbhtml* filename extension, and then add Visual Basic code. This appendix gives you an overview of working with the Visual Basic language and syntax to create ASP.NET Webpages.

> **Note** The default website templates (**Bakery**, **Calendar**, **Photo Gallery**, and **Starter Site**) are available in C# and Visual Basic versions. You can install the Visual Basic templates by using the **ASP.NET Web Pages Administration** tool in WebMatrix. Open the Administration tool as described in Chapter 1 and search for *VB*, and then install the templates you need. Website templates are installed in the root folder of your site in a folder named *Microsoft Templates*.

What you'll learn

- The top 8 programming tips.
- Visual Basic language and syntax.

The Top 8 Programming Tips

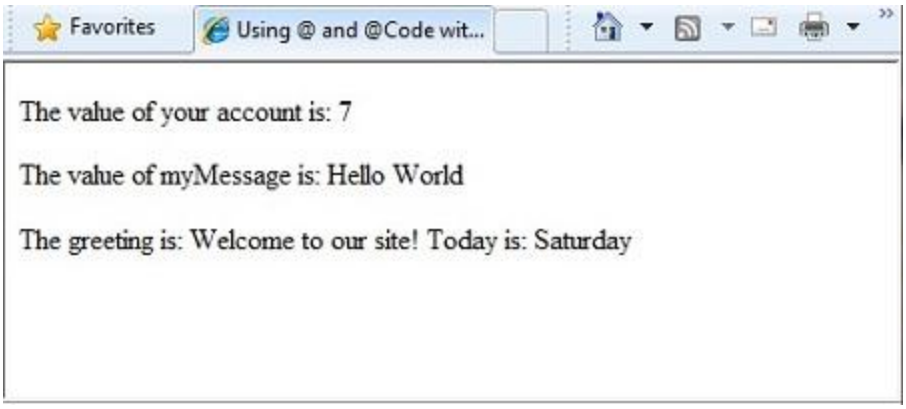
This section lists a few tips that you absolutely need to know as you start writing ASP.NET server code using the Razor syntax.

1. You add code to a page using the @ character

The @ character starts inline expressions, single-statement blocks, and multi-statement blocks:

```
<!-- Single statement blocks  -->
@Code  Dim total = 7  End Code
@Code  Dim myMessage = "Hello World" End Code

<!-- Inline expressions -->
<p>The value of your account is: @total </p>
<p>The value of myMessage is: @myMessage</p>

<!-- Multi-statement block -->
@Code
    Dim greeting = "Welcome to our site!"
    Dim weekDay = DateTime.Now.DayOfWeek
    Dim greetingMessage = greeting & " Today is: " & weekDay.ToString()
End Code
<p>The greeting is: @greetingMessage</p>
```

The result displayed in a browser:



HTML Encoding

When you display content in a page using the `@` character, as in the preceding examples, ASP.NET HTML-encodes the output. This replaces reserved HTML characters (such as `<` and `>` and `&`) with codes that enable the characters to be displayed as characters in a web page instead of being interpreted as HTML tags or entities. Without HTML encoding, the output from your server code might not display correctly, and could expose a page to security risks.

If your goal is to output HTML markup that renders tags as markup (for example `<p></p>` for a paragraph or `<em></em>` to emphasize text), see the section Combining Text, Markup, and Code in Code Blocks later in this chapter.

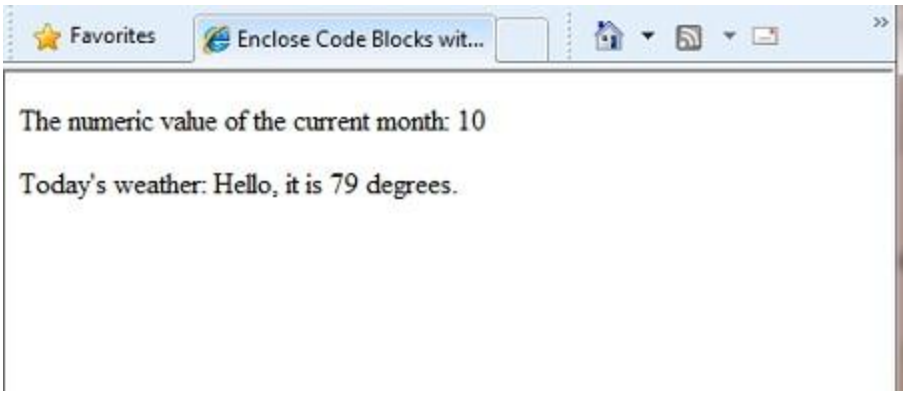
You can read more about HTML encoding in Chapter 4 - Working with Forms.

2. You enclose code blocks with Code...End Code

A code block includes one or more code statements and is enclosed with the keywords `Code` and `End Code`. Place the opening `Code` keyword immediately after the `@` character — there can't be whitespace between them.

```
<!-- Single statement block.  -->
@Code
    Dim theMonth = DateTime.Now.Month
End Code
<p>The numeric value of the current month: @theMonth</p>

<!-- Multi-statement block. -->
@Code
    Dim outsideTemp = 79
    Dim weatherMessage = "Hello, it is " & outsideTemp & " degrees."
End Code
<p>Today's weather: @weatherMessage</p>
```

The result displayed in a browser:



3. Inside a block, you end each code statement with a line break

In a Visual Basic code block, each statement ends with a line break. (Later in the chapter you'll see a way to wrap a long code statement into multiple lines if needed.)

```
<!-- Single statement block. -->
@Code
    Dim theMonth = DateTime.Now.Month
End Code

<!-- Multi-statement block. -->
@Code
    Dim outsideTemp = 79
    Dim weatherMessage = "Hello, it is " & outsideTemp & " degrees."
End Code

<!-- An inline expression, so no line break needed. -->
<p>Today's weather: @weatherMessage</p>
```

4. You use variables to store values

You can store values in a variable, including strings, numbers, and dates, etc. You create a new variable using the `Dim` keyword. You can insert variable values directly in a page using `@`.

```
<!-- Storing a string -->
@Code
    Dim welcomeMessage = "Welcome, new members!"
End Code
<p>@welcomeMessage</p>

<!-- Storing a date -->
@Code
    Dim year = DateTime.Now.Year
End Code

<!-- Displaying a variable -->
<p>Welcome to our new members who joined in @year!</p>
```

The result displayed in a browser:

5. You enclose literal string values in double quotation marks

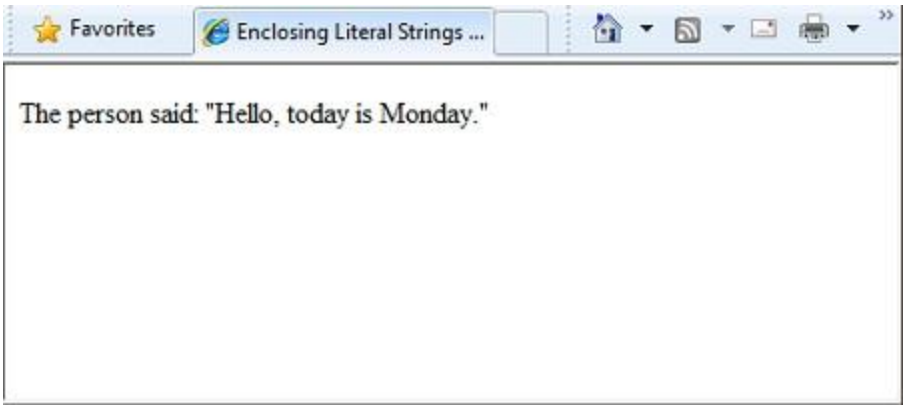
A *string* is a sequence of characters that are treated as text. To specify a string, you enclose it in double quotation marks:

```
@Code
    Dim myString = "This is a string literal"
End Code
```

To embed double quotation marks within a string value, insert two double quotation mark characters. If you want the double quotation character to appear once in the page output, enter it as `""` within the quoted string, and if you want it to appear twice, enter it as `""""` within the quoted string.

```
<!-- Embedding double quotation marks in a string -->
@Code
    Dim myQuote = "The person said: ""Hello, today is Monday."""
End Code
<p>@myQuote</p>
```

The result displayed in a browser:



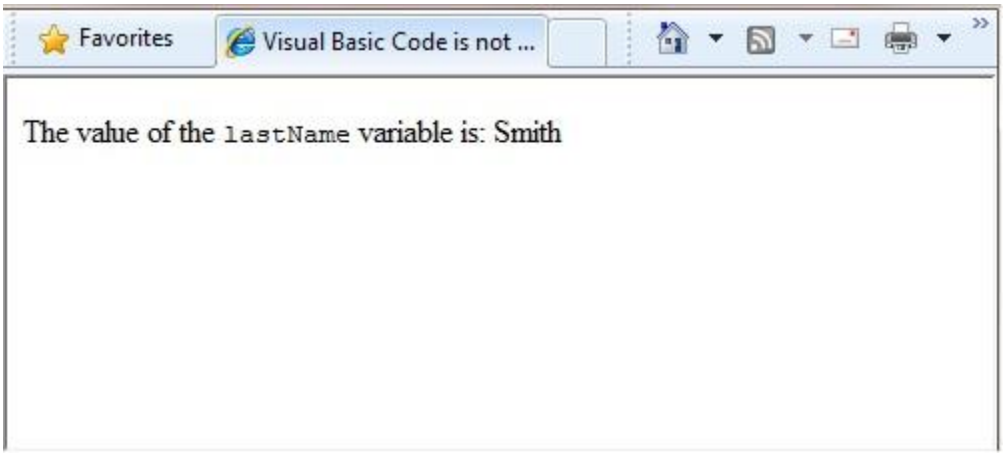
6. Visual Basic code is not case sensitive

The Visual Basic language is not case sensitive. Programming keywords (like `Dim`, `If`, and `True`) and variable names (like `myString`, or `subTotal`) can be written in any case.

The following lines of code assign a value to the variable `lastname` using a lowercase name, and then output the variable value to the page using an uppercase name.

```
@Code
    Dim lastName = "Smith"
    ' Keywords like dim are also not case sensitive.
    DIM someNumber = 7
End Code
<p>The value of the <code>lastName</code> variable is: @LASTNAME</p>
```

The result displayed in a browser:



7. Much of your coding involves working with objects

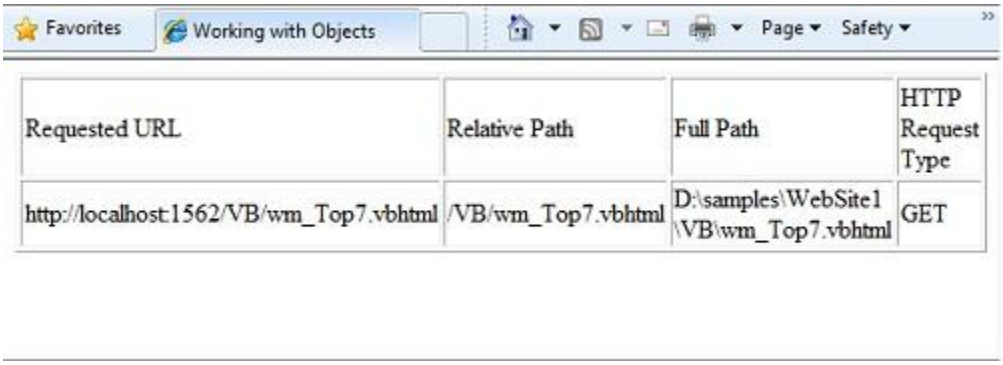
An object represents a thing that you can program with — a page, a text box, a file, an image, a web request, an email message, a customer record (database row), etc. Objects have properties that describe their characteristics — a text box object has a `Text` property, a request object has a `Url` property, an email message has a `From` property, and a customer object has a `FirstName` property. Objects also have methods that are the "verbs" they can perform. Examples include a file object's `Save` method, an image object's `Rotate` method, and an email object's `Send` method.

You'll often work with the `Request` object, which gives you information like the values of form fields on the page (text boxes, etc.), what type of browser made the request, the URL of the page, the user identity, etc. This example shows how to access properties of the `Request` object and how to call the `MapPath` method of the `Request` object, which gives you the absolute path of the page on the server:

```
<table border="1">
    <tr>
        <td>Requested URL</td>
        <td>Relative Path</td>
```

```
        <td>Full Path</td>
        <td>HTTP Request Type</td>
    </tr>
    <tr>
        <td>@Request.Url</td>
        <td>@Request.FilePath</td>
        <td>@Request.MapPath(Request.FilePath)</td>
        <td>@Request.RequestType</td>
    </tr>
</table>
```

The result displayed in a browser:



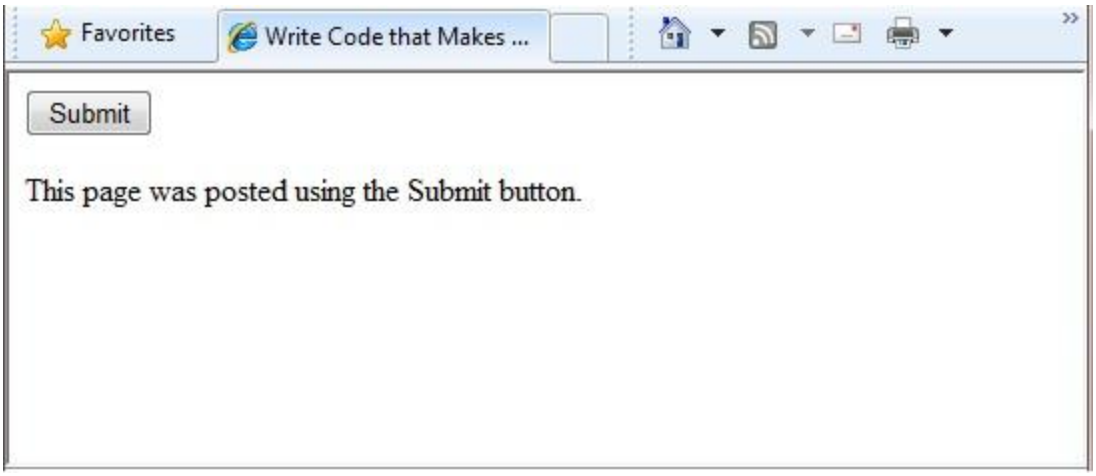
8. You can write code that makes decisions

A key feature of dynamic web pages is that you can determine what to do based on conditions. The most common way to do this is with the `If` statement (and optional `Else` statement).

```
@Code
   Dim result = ""
   If IsPost Then
      result = "This page was posted using the Submit button."
   Else
      result = "This was the first request for this page."
   End If
End Code
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8" />
        <title>Write Code that Makes Decisions</title>
    </head>
<body>

    <form method="POST" action="" >
        <input type="Submit" name="Submit" value="Submit"/>
        <p>@result</p>
    </form>

</body>
</html>
```

The statement `If IsPost` is a shorthand way of writing `If IsPost = True`. Along with `If` statements, there are a variety of ways to test conditions, repeat blocks of code, and so on, which are described later in this chapter.

The result displayed in a browser (after clicking **Submit**):



HTTP GET and POST Methods and the IsPost Property

The protocol used for web pages (HTTP) supports a very limited number of methods ("verbs") that are used to make requests to the server. The two most common ones are GET, which is used to read a page, and POST, which is used to submit a page. In general, the first time a user requests a page, the page is requested using GET. If the user fills in a form and then clicks **Submit**, the browser makes a POST request to the server.

In web programming, it's often useful to know whether a page is being requested as a GET or as a POST so that you know how to process the page. In ASP.NET Web Pages, you can use the `IsPost` property to see whether a request is a GET or a POST. If the request is a POST, the `IsPost` property will return true, and you can do things like read the values of text boxes on a form. Many examples in this book show you how to process the page differently depending on the value of `IsPost`.

A Simple Code Example

This procedure shows you how to create a page that illustrates basic programming techniques. In the example, you create a page that lets users enter two numbers, then it adds them and displays the result.

1. In your editor, create a new file and name it *AddNumbers.vbhtml*.
2. Copy the following code and markup into the page, replacing anything already in the page.

```
@Code
    Dim total = 0
    Dim totalMessage = ""
```

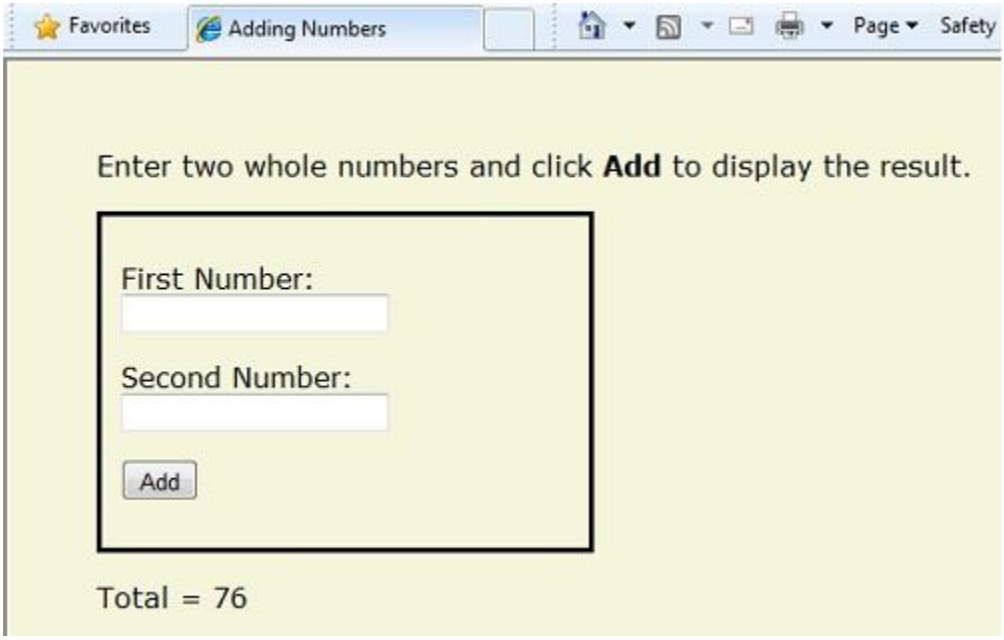
```
    if IsPost Then
        ' Retrieve the numbers that the user entered.
        Dim num1 = Request("text1")
        Dim num2 = Request("text2")
        ' Convert the entered strings into integers numbers and add.
        total = num1.AsInt() + num2.AsInt()
        totalMessage = "Total = " & total
    End If
End Code
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8" />
        <title>Adding Numbers</title>
        <style type="text/css">
            body {background-color: beige; font-family: Verdana, Ariel;
                margin: 50px;
                }
            form {padding: 10px; border-style: solid; width: 250px;}
        </style>
    </head>
<body>
    <p>Enter two whole numbers and click <strong>Add</strong> to display the
result.</p>
    <p></p>
    <form action="" method="post">
    <p><label for="text1">First Number:</label>
    <input type="text" name="text1" />
    </p>
    <p><label for="text2">Second Number:</label>
    <input type="text" name="text2" />
    </p>
    <p><input type="submit" value="Add" /></p>
    </form>
    <p>@totalMessage</p>
</body>
</html>
```

Here are some things for you to note:

- The `@` character starts the first block of code in the page, and it precedes the `totalMessage` variable embedded near the bottom.
- The block at the top of the page is enclosed in `Code...End Code`.
- The variables `total`, `num1`, `num2`, and `totalMessage` store several numbers and a string.
- The literal string value assigned to the `totalMessage` variable is in double quotation marks.
- Because Visual Basic code is not case sensitive, when the `totalMessage`variable is used near the bottom of the page, its name only needs to match the spelling of the variable declaration at the top of the page. The casing doesn't matter.
- The expression `num1.AsInt()` + `num2.AsInt()` shows how to work with objects and methods. The `AsInt` method on each variable converts the string entered by a user to a whole number (an integer) that can be added.
- The `<form>` tag includes a `method="post"` attribute. This specifies that when the user clicks **Add**, the page will be sent to the server using the HTTP POST method. When the

page is submitted, the code `If IsPost` evaluates to true and the conditional code runs, displaying the result of adding the numbers.

3. Save the page and run it in a browser. (Make sure the page is selected in the **Files** workspace before you run it.) Enter two whole numbers and then click the **Add** button.



Visual Basic Language and Syntax

In Chapter 1 - Getting Started with ASP.NET Web Pages, you saw a basic example of how to create an ASP.NET web page, and how you can add server code to HTML markup. Here you'll learn the basics of using Visual Basic to write ASP.NET server code using the Razor syntax — that is, the programming language rules.

If you're experienced with programming (especially if you've used C, C++, C#, Visual Basic, or JavaScript), much of what you read here will be familiar. You'll probably need to familiarize yourself only with how WebMatrix code is added to markup in *.vbhtml* files.

Basic Syntax

Combining Text, Markup, and Code in Code Blocks

In server code blocks, you'll often want to output text and markup to the page. If a server code block contains text that's not code and that instead should be rendered as is, ASP.NET needs to be able to distinguish that text from code. There are several ways to do this.

- Enclose the text in an HTML block element like `<p></p>` or `<em></em>`:

```
@If IsPost Then
    ' This line has all content between matched <p> tags.
    @<p>Hello, the time is @DateTime.Now and this page is a postback!</p>
Else
    ' All content between matched tags, followed by server code.
    @<p>Hello, <em>Stranger!</em> today is: </p> @DateTime.Now
End If
```

The HTML element can include text, additional HTML elements, and server-code expressions. When ASP.NET sees the opening HTML tag, it renders everything the element and its content as is to the browser (and resolves the server-code expressions).

- Use the `@:` operator or the `<text>` element. The `@:` outputs a single line of content containing plain text or unmatched HTML tags; the `<text>` element encloses multiple lines to output. These options are useful when you don't want to render an HTML element as part of the output.

```
@If IsPost Then
    ' Plain text followed by an unmatched HTML tag and server code.
    @:The time is: <br /> @DateTime.Now
    ' Server code and then plain text, matched tags, and more text.
    @DateTime.Now @:is the <em>current</em> time.
End If
```

The following example repeats the previous example but uses a single pair of `<text>` tags to enclose the text to render.

```
@If IsPost Then
    @<text>
    The time is: <br /> @DateTime.Now
    @DateTime.Now is the <em>current</em> time.
    </text>
End If
```

In the following example, the `<text>` and `</text>` tags enclose three lines, all of which have some uncontained text and unmatched HTML tags (`<br />`), along with server code and matched HTML tags. Again, you could also precede each line individually with the `@:` operator; either way works.

```
@Code
    dim minTemp = 75
    @<text>It is the month of @DateTime.Now.ToString("MMMM"), and
    it's a <em>great</em> day! <p>You can go swimming if it's at
    least @minTemp degrees.</p></text>
End Code
```

Note When you output text as shown in this section — using an HTML element, the `@:` operator, or the `<text>` element — ASP.NET doesn't HTML-encode the output. (As noted earlier, ASP.NET does encode the output of server code expressions and server code blocks that are preceded by `@`, except in the special cases noted in this section.)

Whitespace

Extra spaces in a statement (and outside of a string literal) don't affect the statement:

```
@Code Dim personName =    "Smith"    End Code
```

Breaking Long Statements into Multiple Lines

You can break a long code statement into multiple lines by using the underscore character _ (which in Visual Basic is called the *continuation character*) after each line of code. To break a statement onto the next line, at the end of the line add a space and then the continuation character. Continue the statement on the next line. You can wrap statements onto as many lines as you need to improve readability. The following statements are the same:

```
@Code
    Dim familyName _
    =  "Smith"
End Code

@Code
    Dim _
    theName _
    = _
    "Smith"
End Code
```

However, you can't wrap a line in the middle of a string literal. The following example doesn't work:

```
@Code
    ' Doesn't work.
    Dim test = "This is a long _
      string"
End Code
```

To combine a long string that wraps to multiple lines like the above code, you would need to use the *concatenation operator* (&), which you'll see later in this chapter.

Code Comments

Comments let you leave notes for yourself or others. Razor syntax comments are prefixed with @* and end with *@.

```
@* A single-line comment is added like this example. *@

@*
    This is a multiline code comment.
    It can continue for any number of lines.
*@
```

Within code blocks you can use the Razor syntax comments, or you can use ordinary Visual Basic comment character, which is a single quote (`'`) prefixed to each line.

```
@Code
    ' You can make comments in blocks by just using ' before each line.
End Code

@Code
    ' There is no multi-line comment character in Visual Basic.
    ' You use a ' before each line you want to comment.
End Code
```

Variables

A variable is a named object that you use to store data. You can name variables anything, but the name must begin with an alphabetic character and it cannot contain whitespace or reserved characters. In Visual Basic, as you saw earlier, the case of the letters in a variable name doesn't matter.

Variables and Data Types

A variable can have a specific data type, which indicates what kind of data is stored in the variable. You can have string variables that store string values (like "Hello world"), integer variables that store whole-number values (like 3 or 79), and date variables that store date values in a variety of formats (like 4/12/2010 or March 2009). And there are many other data types you can use. However, you don't have to specify a type for a variable. In most cases ASP.NET can figure out the type based on how the data in the variable is being used. (Occasionally you must specify a type; you'll see examples in this book where this is true.)

To declare a variable without specifying a type, use `Dim` plus the variable name (for instance, `Dim myVar`). To declare a variable with a type, use `Dim` plus the variable name, followed by `As` and then the type name (for instance, `Dim myVar As String`).

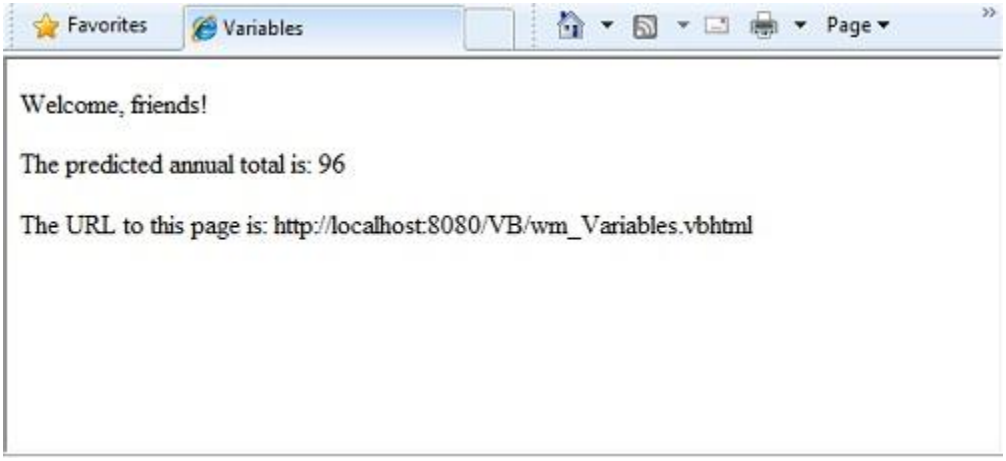
```
@Code
    ' Assigning a string to a variable.
    Dim greeting = "Welcome"

    ' Assigning a number to a variable.
    Dim theCount = 3

    ' Assigning an expression to a variable.
    Dim monthlyTotal = theCount + 5

    ' Assigning a date value to a variable.
    Dim today = DateTime.Today

    ' Assigning the current page's URL to a variable.
    Dim myPath = Request.Url

    ' Declaring variables using explicit data types.
    Dim name as String = "Joe"
    Dim count as Integer = 5
```

```
    Dim tomorrow as DateTime = DateTime.Now.AddDays(1)
End Code
```

The following example shows some inline expressions that use the variables in a web page.

```
@Code
    ' Embedding the value of a variable into HTML markup.
    ' Precede the markup with @ because we are in a code block.
    @<p>@greeting, friends!</p>
End Code

<!-- Using a variable with an inline expression in HTML. -->
<p>The predicted annual total is: @( monthlyTotal * 12)</p>

<!--  Displaying the page URL with a variable. -->
<p>The URL to this page is:  @myPath</p>
```

The result displayed in a browser:



Converting and Testing Data Types

Although ASP.NET can usually determine a data type automatically, sometimes it can't. Therefore, you might need to help ASP.NET out by performing an explicit conversion. Even if you don't have to convert types, sometimes it's helpful to test to see what type of data you might be working with.

The most common case is that you have to convert a string to another type, such as to an integer or date. The following example shows a typical case where you must convert a string to a number.

```
@Code
    Dim total = 0
    Dim totalMessage = ""
    if IsPost Then
        ' Retrieve the numbers that the user entered.
        Dim num1 = Request("text1")
        Dim num2 = Request("text2")
        ' Convert the entered strings into integers numbers and add.
        total = num1.AsInt() + num2.AsInt()
```

```
        totalMessage = "Total = " & total
    End If
End Code
```

As a rule, user input comes to you as strings. Even if you've prompted the user to enter a number, and even if they've entered a digit, when user input is submitted and you read it in code, the data is in string format. Therefore, you must convert the string to a number. In the example, if you try to perform arithmetic on the values without converting them, the following error results, because ASP.NET cannot add two strings:

```
Cannot implicitly convert type 'string' to 'int'.
```

To convert the values to integers, you call the `AsInt` method. If the conversion is successful, you can then add the numbers.

The following table lists some common conversion and test methods for variables.

Method	Description	Example

`AsInt()`, `IsInt()`	Converts a string that represents a whole number (like "593") to an integer.	`Dim myIntNumber = 0`
		`Dim myStringNum = "539"`
		`If myStringNum.IsInt() Then`
		`  myIntNumber = myStringNum.AsInt()`
		`End If`

`AsBool()`, `IsBool()`	Converts a string like "true" or "false" to a Boolean type.	`Dim myStringBool = "True"` `Dim myVar = myStringBool.AsBool()`
`AsFloat()`, `IsFloat()`	Converts a string that has a decimal value like "1.3" or "7.439" to a floating-point number.	`Dim myStringFloat = "41.432895"` `Dim myFloatNum = myStringFloat.AsFloat()`
`AsDecimal()`, `IsDecimal()`	Converts a string that has a decimal value like "1.3" or "7.439" to a decimal number. (In ASP.NET, a decimal number is more precise than a floating-point number.)	`Dim myStringDec = "10317.425"` `Dim myDecNum = myStringDec.AsDecimal()`
`AsDateTime()`, `IsDateTime()`	Converts a string that represents a date and time value to the ASP.NET `DateTime` type.	`Dim myDateString = "12/27/2010"` `Dim newDate = myDateString.AsDateTime()`

`ToString()`	Converts any other data type to a string.	`Dim num1 As Integer = 17`
		`Dim num2 As Integer = 76`
		
		`' myString is set to 1776`
		`Dim myString as String = num1.ToString()`
		`& num2.ToString()`

Operators

An operator is a keyword or character that tells ASP.NET what kind of command to perform in an expression. Visual Basic supports many operators, but you only need to recognize a few to get started developing ASP.NET web pages. The following table summarizes the most common operators.

Operator	Description	Examples

+
-
*
/
	Math operators used in numerical expressions.	`@(5 + 13)`
		
		`Dim netWorth = 150000`
		`Dim newTotal = netWorth * 2`
		`@(newTotal / 2)`

=	Assignment and equality. Depending on context, either assigns the value on the right side of a statement to the object on the left side, or checks the values for equality.	`Dim age = 17`
		
		`Dim income = Request("AnnualIncome")`

<>	Inequality. Returns `True` if the values are not equal.	`Dim theNum = 13`
		`If theNum <> 15 Then`
		`    ' Do something.`
		`End If`

<
>
<=
>=
	Less than,
	greater than,
	less than or equal, and
	greater than or equal.
		`If 2 < 3 Then`
		`    ' Do something.`
		`End If`
		
		`Dim currentCount = 12`
		`If currentCount >= 12 Then`
		`    ' Do something.`
		`End If`

&	Concatenation, which is used to join strings.	`' The displayed result is "abcdef".` `@("abc" & "def")`
+= -=	The increment and decrement operators, which add and subtract 1 (respectively) from a variable.	`Dim theCount As Integer = 0` `theCount += 1 ' Adds 1 to count`
.	Dot. Used to distinguish objects and their properties and methods.	`Dim myUrl = Request.Url` `Dim count = Request("Count").AsInt()`

()	Parentheses. Used to group expressions, to pass parameters to methods, and to access members of arrays and collections.	`@(3 + 7)`
		
		`@Request.MapPath(Request.FilePath)`

`Not`	Not. Reverses a true value to false and vice versa. Typically used as a shorthand way to test for `False` (that is, for not `True`).	`Dim taskCompleted As Boolean = False`
		`' Processing.`
		`If Not taskCompleted Then`
		`    ' Continue processing`
		`End If`

`AndAlso`
`OrElse`
	Logical AND and OR, which are used to link conditions together.	`Dim myTaskCompleted As Boolean = false`
		`Dim totalCount As Integer = 0`
		`' Processing.`
		`If (Not myTaskCompleted) AndAlso`
		`totalCount < 12 Then`
		`    ' Continue processing.`
		`End If`

Working with File and Folder Paths in Code

You'll often work with file and folder paths in your code. Here is an example of physical folder structure for a website as it might appear on your development computer:

```
C:\WebSites\MyWebSite
    default.cshtml
    datafile.txt
    \images
        Logo.jpg
    \styles
        Styles.css
```

On a web server, a website also has a virtual folder structure that corresponds (maps) to the physical folders on your site. (One way to think of the virtual path is that it's the part of a URL that follows the domain.) By default, virtual folder names are the same as the physical folder names. The virtual root is represented as a slash (/), just like the root folder on the C: drive of your computer is represented by a backslash (\). (Virtual folder paths always use forward slashes.) Here are the physical and virtual paths for the file *StyleSheet.css* from the structure shown earlier:

- Physical path: *C:\WebSites\MyWebSiteFolder\styles\StyleSheet.css*
- Virtual path (from the virtual root path /): */styles/StyleSheet.css*

When you work with files and folders in code, sometimes you need to reference the physical path and sometimes a virtual path, depending on what objects you're working with. ASP.NET gives you these tools for working with file and folder paths in code: the ~ operator, the `Server.MapPath` method, and the `Href` method.

The ~ operator: Getting the virtual root

In server code, to specify the virtual root path to folders or files, use the ~ operator. This is useful because you can move your website to a different folder or location without breaking the paths in your code.

```
@Code
    Dim myImagesFolder = "~/images"
    Dim myStyleSheet = "~/styles/StyleSheet.css"
End Code
```

The Server.MapPath method: Converting virtual to physical paths

The `Server.MapPath` method converts a virtual path (like */default.cshtml*) to an absolute physical path (like *C:\WebSites\MyWebSiteFolder\default.cshtml*). You use this method for tasks that require a complete physical path, like reading or writing a text file on the web server. (You typically don't know the absolute physical path of your site on a hosting site's server.) You pass the virtual path to a file or folder to the method, and it returns the physical path:

```
@Code
    Dim dataFilePath = "~/dataFile.txt"
End Code

<!-- Displays a physical path C:\Websites\MyWebSite\datafile.txt  -->
<p>@Server.MapPath(dataFilePath)</p>
```

The Href method: Creating paths to site resources

The `Href` method of the `WebPage` object converts paths that you create in server code (which can include the ~ operator) to paths that the browser understands. (The browser can't understand the ~ operator, because that's strictly an ASP.NET operator.) You use the `Href` method to create paths to resources like image files, other web pages, and CSS files. For example, you can use this method in HTML markup for attributes of `<img>` elements, `<link>` elements, and `<a>` elements.

```
@Code
    Dim myImagesFolder = "~/images"
    Dim myStyleSheet = "~/styles/StyleSheet.css"
End Code

<!-- This code creates the path "../images/Logo.jpg" in the src attribute. -->
<img src="@Href(myImagesFolder)/Logo.jpg" />

<!--  This produces the same result, using a path with ~  -->
<img src="@Href("~/images")/Logo.jpg" />

<!--  This creates a link to the CSS file. -->
<link rel="stylesheet" type="text/css" href="@Href(myStyleSheet)" />
```

Conditional Logic and Loops

ASP.NET server code lets you perform tasks based on conditions and write code that repeats statements a specific number of times that is, code that runs a loop).

Testing Conditions

To test a simple condition you use the `If...Then` statement, which returns `True` or `False` based on a test you specify:

```
@Code
    Dim showToday = True
    If showToday Then
        DateTime.Today
    End If
End Code
```

The `If` keyword starts a block. The actual test (condition) follows the `If` keyword and returns true or false. The `If` statement ends with `Then`. The statements that will run if the test is true are enclosed by `If` and `End If`. An `If` statement can include an `Else` block that specifies statements to run if the condition is false:

```
@Code
    Dim showToday = False
    If showToday Then
        DateTime.Today
    Else
        @<text>Sorry!</text>
    End If
End Code
```

If an `If` statement starts a code block, you don't have to use the normal `Code...End Code` statements to include the blocks. You can just add `@` to the block, and it will work. This approach works with `If` as well as other Visual Basic programming keywords that are followed by code blocks, including `For`, `For Each`, `Do While`, etc.

```
@If showToday Then
    DateTime.Today
Else
    @<text>Sorry!</text>
End If
```

You can add multiple conditions using one or more `ElseIf` blocks:

```
@Code
    Dim theBalance = 4.99
    If theBalance = 0 Then
        @<p>You have a zero balance.</p>
    ElseIf theBalance > 0 AndAlso theBalance <= 5 Then
        ' If the balance is above 0 but less than
        ' or equal to $5, display this message.
        @<p>Your balance of $@theBalance is very low.</p>
    Else
        ' For balances greater than $5, display balance.
        @<p>Your balance is: $@theBalance</p>
    End If
End Code
```

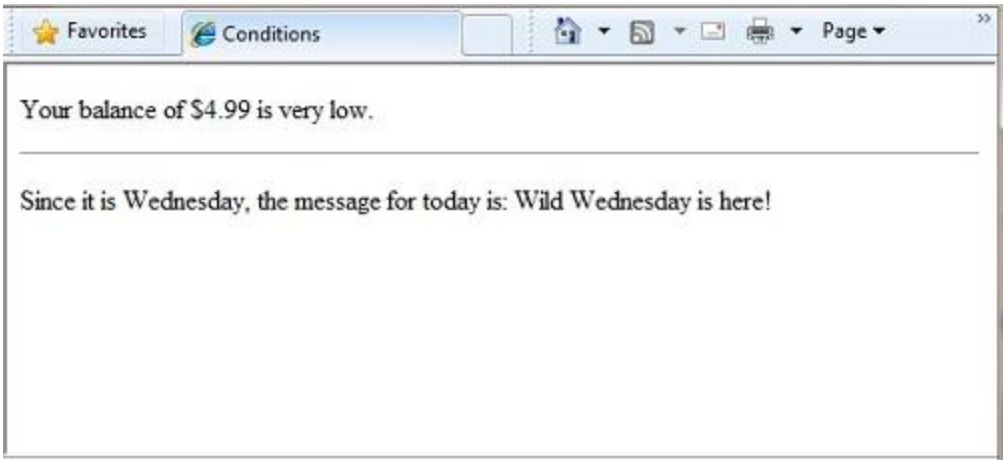
In this example, if the first condition in the `If` block is not true, the `ElseIf` condition is checked. If that condition is met, the statements in the `ElseIf` block are executed. If none of the conditions are met, the statements in the `Else` block are executed. You can add any number of `ElseIf` blocks, and then close with an `Else` block as the "everything else" condition.

To test a large number of conditions, use a `Select Case` block:

```
@Code
    Dim weekday = "Wednesday"
    Dim greeting = ""

    Select Case weekday
        Case "Monday"
            greeting = "Ok, it's a marvelous Monday."
        Case "Tuesday"
            greeting = "It's a tremendous Tuesday."
        Case "Wednesday"
            greeting = "Wild Wednesday is here!"
        Case Else
            greeting = "It's some other day, oh well."
    End Select
End Code
<p>Since it is @weekday, the message for today is: @greeting</p>
```

The value to test is in parentheses (in the example, the weekday variable). Each individual test uses a `Case` statement that lists a value. If the value of a `Case` statement matches the test value, the code in that `Case` block is executed.

The result of the last two conditional blocks displayed in a browser:



Looping Code

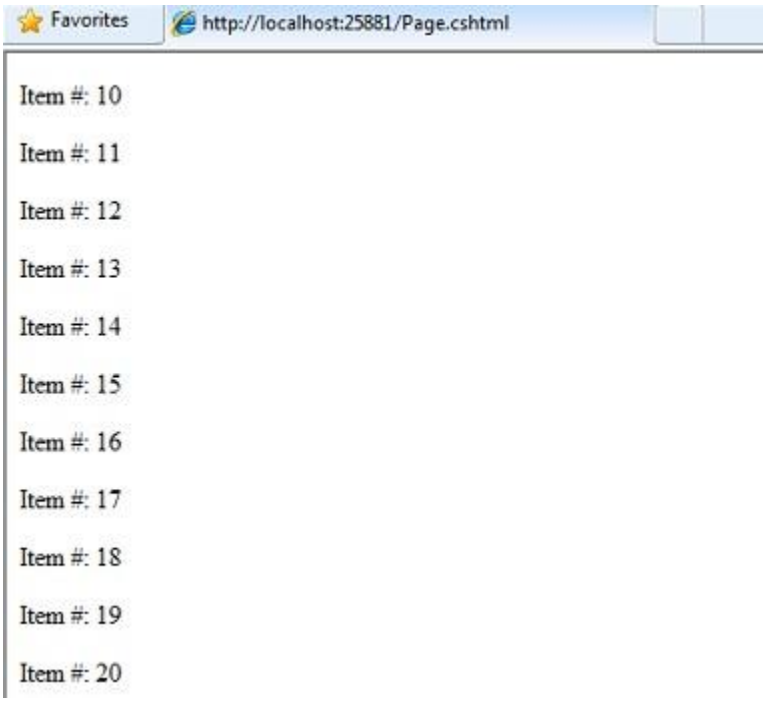
You often need to run the same statements repeatedly. You do this by looping. For example, you often run the same statements for each item in a collection of data. If you know exactly how many times you want to loop, you can use a `For` loop. This kind of loop is especially useful for counting up or counting down:

```
@For i = 10 To 20
    @<p>Item #: @i</p>
Next i
```

The loop begins with the `For` keyword, followed by three elements:

- Immediately after the `For` statement, you declare a counter variable (you don't have to use `Dim`) and then indicate the range, as in `i = 10 to 20`. This means the variable `i` will start counting at 10 and continue until it reaches 20 (inclusive).
- Between the `For` and `Next` statements is the content of the block. This can contain one or more code statements that execute with each loop.
- The `Next i` statement ends the loop. It increments the counter and starts the next iteration of the loop.

The line of code between the `For` and `Next` lines contains the code that runs for each iteration of the loop. The markup creates a new paragraph (`<p>` element) each time and adds a line to the output, displaying the value of i (the counter). When you run this page, the example creates 11 lines displaying the output, with the text in each line indicating the item number.



If you're working with a collection or array, you often use a `For Each` loop. A collection is a group of similar objects, and the `For Each` loop lets you carry out a task on each item in the collection. This type of loop is convenient for collections, because unlike a `For` loop, you don't have to increment the counter or set a limit. Instead, the `For Each` loop code simply proceeds through the collection until it's finished.

This example returns the items in the `Request.ServerVariables` collection (which contains information about your web server). It uses a `For Each` loop to display the name of each item by creating a new `<li>` element in an HTML bulleted list.

```
<ul>
@For Each myItem In Request.ServerVariables
    @<li>@myItem</li>
Next myItem
</ul>
```

The `For Each` keyword is followed by a variable that represents a single item in the collection (in the example, `myItem`), followed by the `In` keyword, followed by the collection you want to loop through. In the body of the `For Each` loop, you can access the current item using the variable that you declared earlier.

- ALL_HTTP
- ALL_RAW
- APPL_MD_PATH
- APPL_PHYSICAL_PATH
- AUTH_TYPE
- AUTH_USER
- AUTH_PASSWORD
- LOGON_USER
- REMOTE_USER
- CERT_COOKIE
- CERT_FLAGS
- CERT_ISSUER
- CERT_KEYSIZE
- CERT_SECRETKEYSIZE
- CERT_SERIALNUMBER
- CERT_SERVER_ISSUER
- CERT_SERVER_SUBJECT
- CERT_SUBJECT
- CONTENT_LENGTH
- CONTENT_TYPE
- GATEWAY_INTERFACE
- HTTPS

To create a more general-purpose loop, use the `Do While` statement:

```
@Code
    Dim countNum = 0
    Do While countNum < 50
        countNum += 1
        @<p>Line #@countNum: </p>
    Loop
End Code
```

This loop begins with the `Do While` keyword, followed by a condition, followed by the block to repeat. Loops typically increment (add to) or decrement (subtract from) a variable or object used for counting.

In the example, the += operator adds 1 to the value of a variable each time the loop runs. (To decrement a variable in a loop that counts down, you would use the decrement operator -=.)

Objects and Collections

Nearly everything in an ASP.NET website is an object, including the web page itself. This section discusses some important objects you'll work with frequently in your code.

Page Objects

The most basic object in ASP.NET is the page. You can access properties of the page object directly without any qualifying object. The following code gets the page's file path, using the `Request` object of the page:

```
@Code
    Dim path = Request.FilePath
End Code
```

You can use properties of the `Page` object to get a lot of information, such as:

- `Request`. As you've already seen, this is a collection of information about the current request, including what type of browser made the request, the URL of the page, the user identity, etc.
- `Response`. This is a collection of information about the response (page) that will be sent to the browser when the server code has finished running. For example, you can use this property to write information into the response.

  ```
  @Code
      ' Access the page's Request object to retrieve the URL.
      Dim pageUrl = Request.Url
  End Code
      <a href="@pageUrl">My page</a>
  ```

Collection Objects (Arrays and Dictionaries)

A collection is a group of objects of the same type, such as a collection of `Customer` objects from a database. ASP.NET contains many built-in collections, like the `Request.Files` collection.

You'll often work with data in collections. Two common collection types are the *array* and the *dictionary*. An array is useful when you want to store a collection of similar items but don't want to create a separate variable to hold each item:

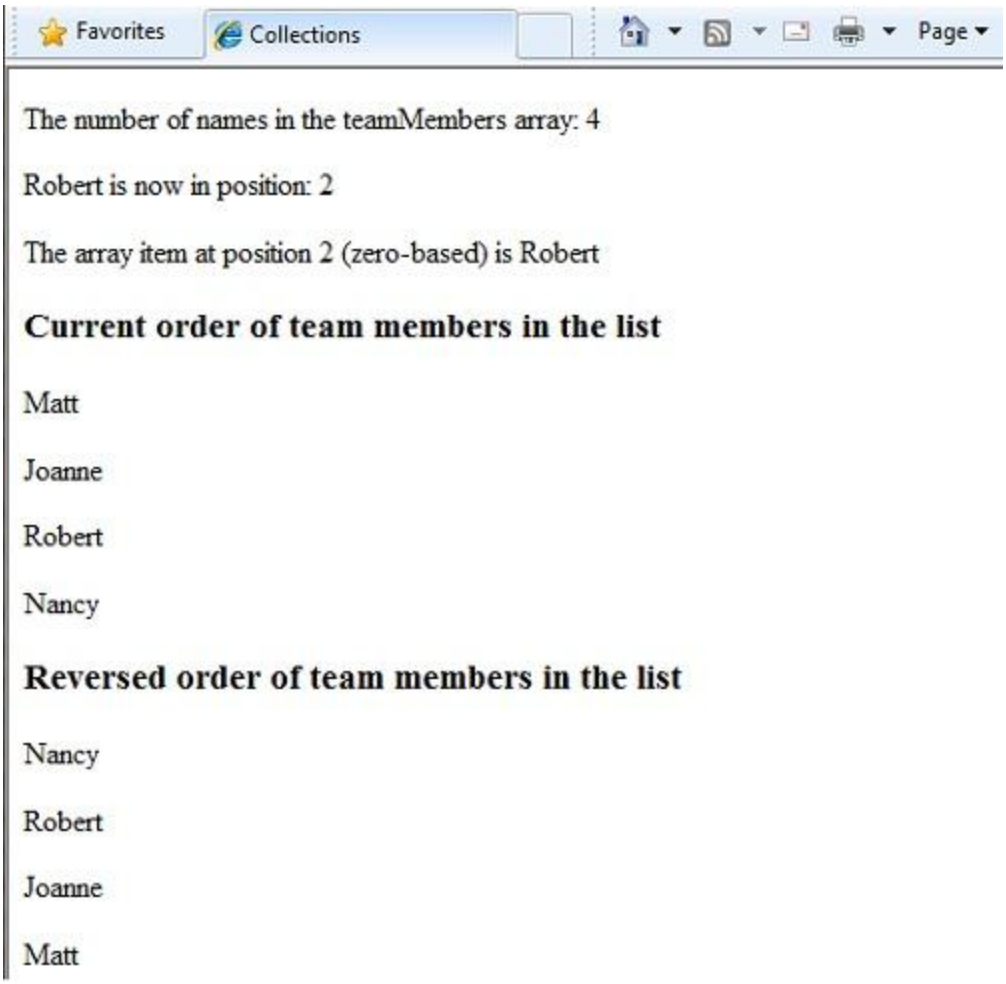
```
<h3>Team Members</h3>
@Code
    Dim teamMembers() As String = {"Matt", "Joanne", "Robert", "Nancy"}
    For Each name In teamMembers
        @<p>@name</p>
    Next name
End Code
```

With arrays, you declare a specific data type, such as `String`, `Integer`, or `DateTime`. To indicate that the variable can contain an array, you add parentheses to the variable name in the declaration (such as `Dim myVar() As String`). You can access items in an array using their position (index) or by using the `For Each` statement. Array indexes are zero-based — that is, the first item is at position 0, the second item is at position 1, and so on.

```
@Code
    Dim teamMembers() As String = {"Matt", "Joanne", "Robert", "Nancy"}
    @<p>The number of names in the teamMembers array: @teamMembers.Length </p>
    @<p>Robert is now in position: @Array.IndexOf(teamMembers, "Robert")</p>
    @<p>The array item at position 2 (zero-based) is @teamMembers(2)</p>
    @<h3>Current order of team members in the list</h3>
    For Each name In teamMembers
        @<p>@name</p>
    Next name
    @<h3>Reversed order of team members in the list</h3>
    Array.Reverse(teamMembers)
    For Each reversedItem In teamMembers
        @<p>@reversedItem</p>
    Next reversedItem
End Code
```

You can determine the number of items in an array by getting its `Length` property. To get the position of a specific item in the array (that is, to search the array), use the `Array.IndexOf` method. You can also do things like reverse the contents of an array (the `Array.Reverse` method) or sort the contents (the `Array.Sort` method).

The output of the string array code displayed in a browser:



A dictionary is a collection of key/value pairs, where you provide the key (or name) to set or retrieve the corresponding value:

```
@Code
    Dim myScores = New Dictionary(Of String, Integer)()
    myScores.Add("test1", 71)
    myScores.Add("test2", 82)
    myScores.Add("test3", 100)
    myScores.Add("test4", 59)
End Code
<p>My score on test 3 is: @myScores("test3")%</p>
@Code
    myScores("test4") = 79
End Code
<p>My corrected score on test 4 is: @myScores("test4")%</p>
```

To create a dictionary, you use the `New` keyword to indicate that you're creating a new `Dictionary` object. You can assign a dictionary to a variable using the `Dim` keyword. You indicate the data types of the items in the dictionary using parentheses (`( )`). At the end of the declaration, you must add another pair of parentheses, because this is actually a method that creates a new dictionary.

To add items to the dictionary, you can call the `Add` method of the dictionary variable (`myScores` in this case), and then specify a key and a value. Alternatively, you can use parentheses to indicate the key and do a simple assignment, as in the following example:

```
@Code
    myScores("test4") = 79
End Code
```

To get a value from the dictionary, you specify the key in parentheses:

```
@myScores("test4")
```

Calling Methods with Parameters

As you saw earlier in the chapter, when you program with objects, the objects can have methods. For example, a `Database` object might have a `Database.Connect` method. Some methods also have one or more parameters. A *parameter* is a value that you pass to a method to enable the method to complete its task. For example, look at a declaration for the `Request.MapPath` method, which you might use when you work with paths in your web pages. For example, look at the declaration for the `Request.MapPath` method, which has three parameters:

```
Public Overridable Function MapPath (virtualPath As String, _
    baseVirtualDir As String, _
    allowCrossAppMapping As Boolean)
```

This method returns the physical path on the server that corresponds to a specified virtual path. The three parameters for the method are `virtualPath`, `baseVirtualDir`, and `allowCrossAppMapping`. (Notice that in the declaration, the parameters are listed with the data types of the data that they'll accept.) When you call this method, you must supply values for all three parameters.

When you're using Visual Basic with the Razor syntax, you have two options for passing parameters to a method: *positional parameters* or *named parameters*. To call a method using positional parameters, you pass the parameters in a strict order that's specified in the method declaration. (You would typically know this order by reading documentation for the method.) You must follow the order, and you can't skip any of the parameters — if necessary, you pass an empty string (`""`) or null for a positional parameter that you don't have a value for.

The following example assumes you have a folder named *scripts* on your website. The code calls the `Request.MapPath` method and passes values for the three parameters in the correct order. It then displays the resulting mapped path.

```
@Code
    ' Pass parameters to a method using positional parameters.
    Dim myPathPositional = Request.MapPath("/scripts", "/", true)
End Code
<p>@myPathPositional</p>
```

When there are many parameters for a method, you can keep your code cleaner and more readable by using named parameters. To call a method using named parameters, specify the parameter name followed by := and then provide the value. An advantage of named parameters is that you can add them in any order you want. (A disadvantage is that the method call is not as compact.)

The following examples calls the same method as above, but uses named parameters to supply the values in a different order from the positional parameters:

```
@Code
    ' Pass parameters to a method using named parameters.
    Dim myPathNamed = Request.MapPath(baseVirtualDir:= "/", allowCrossAppMapping:= true,
virtualPath:= "/scripts")
End Code
<p>@myPathNamed</p>
```

As you can see, the parameters are passed in a different order. However, if you run the previous example and this example, they'll return the same value.

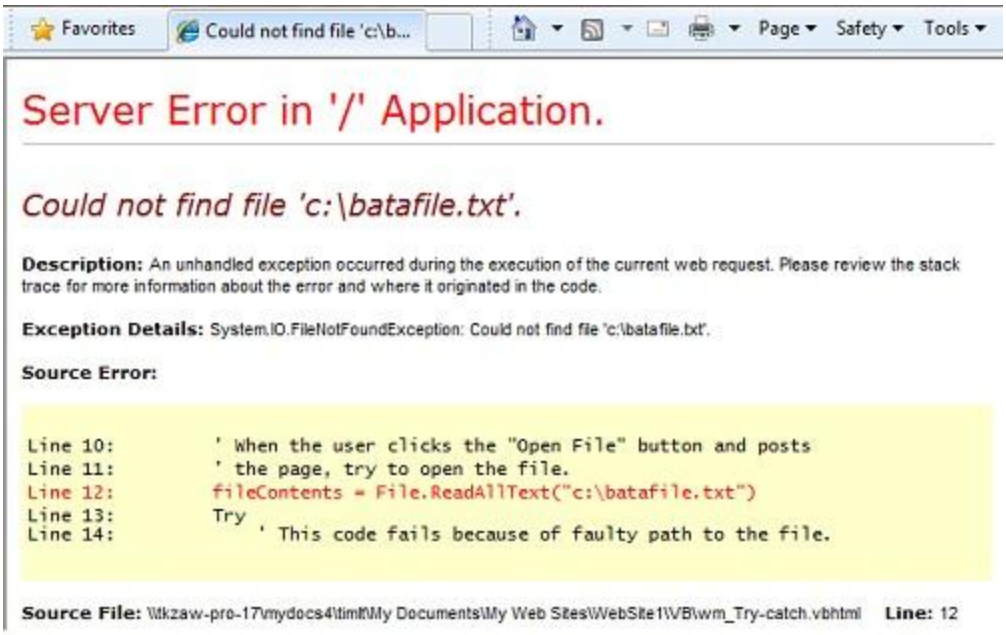
Handling Errors

Try-Catch Statements

You'll often have statements in your code that might fail for reasons outside your control. For example:

- If your code tries to open, create, read, or write a file, all sorts of errors might occur. The file you want might not exist, it might be locked, the code might not have permissions, and so on.
- Similarly, if your code tries to update records in a database, there can be permissions issues, the connection to the database might be dropped, the data to save might be invalid, and so on.

In programming terms, these situations are called *exceptions*. If your code encounters an exception, it generates (throws) an error message that is, at best, annoying to users.



In situations where your code might encounter exceptions, and in order to avoid error messages of this type, you can use `Try/Catch` statements. In the `Try` statement, you run the code that you're checking. In one or more `Catch` statements, you can look for specific errors (specific types of exceptions) that might have occurred. You can include as many `Catch` statements as you need to look for errors that you're anticipating.

> **Note** We recommend that you avoid using the `Response.Redirect` method in `Try/Catch` statements, because it can cause an exception in your page.

The following example shows a page that creates a text file on the first request and then displays a button that lets the user open the file. The example deliberately uses a bad file name so that it will cause an exception. The code includes `Catch` statements for two possible exceptions: `FileNotFoundException`, which occurs if the file name is bad, and `DirectoryNotFoundException`, which occurs if ASP.NET can't even find the folder. (You can uncomment a statement in the example in order to see how it runs when everything works properly.)

If your code didn't handle the exception, you would see an error page like the previous screen shot. However, the `Try/Catch` section helps prevent the user from seeing these types of errors.

```
@Code
    Dim dataFilePath = "~/dataFile.txt"
    Dim fileContents = ""
    Dim physicalPath = Server.MapPath(dataFilePath)
    Dim userMessage = "Hello world, the time is " + DateTime.Now
    Dim userErrMsg = ""
    Dim errMsg = ""

    If IsPost Then
        ' When the user clicks the "Open File" button and posts
```

```
        ' the page, try to open the file.
        Try
            ' This code fails because of faulty path to the file.
            fileContents = File.ReadAllText("c:\batafile.txt")

            ' This code works. To eliminate error on page,
            ' comment the above line of code and uncomment this one.
            ' fileContents = File.ReadAllText(physicalPath)

        Catch ex As FileNotFoundException
            ' You can use the exception object for debugging, logging, etc.
            errMsg = ex.Message
            ' Create a friendly error message for users.
            userErrMsg = "The file could not be opened, please contact " _
                & "your system administrator."

        Catch ex As DirectoryNotFoundException
            ' Similar to previous exception.
            errMsg = ex.Message
            userErrMsg = "The file could not be opened, please contact " _
                & "your system administrator."
        End Try
    Else
        ' The first time the page is requested, create the text file.
        File.WriteAllText(physicalPath, userMessage)
    End If
End Code
<!DOCTYPE html>
<html lang="en">
    <head>
        <meta charset="utf-8" />
        <title>Try-Catch Statements</title>
    </head>
    <body>
    <form method="POST" action="" >
      <input type="Submit" name="Submit" value="Open File"/>
    </form>

    <p>@fileContents</p>
    <p>@userErrMsg</p>

    </body>
</html>
```

Additional Resources

Reference Documentation

- ASP.NET
- Visual Basic Language

Appendix – Programming ASP.NET Web Pages in Visual Studio

This appendix explains how you can use Visual Studio 2010 or Visual Web Developer 2010 Express to program ASP.NET Web Pages with the Razor syntax.

What you'll learn

- How to Install Visual Web Developer 2010 Express and the ASP.NET Razor Tools (included with the ASP.NET MVC3 RTM release)
- Using features in Visual Studio to work with ASP.NET Razor pages, including IntelliSense and the debugger.

Why Use Visual Studio?

You can program ASP.NET Web pages with Razor syntax using WebMatrix or many other code editors. You can also use Microsoft Visual Studio 2010, which is a full-featured integrated development environment (IDE) that provides a powerful set of tools for creating many types of applications (not just websites). To work with ASP.NET Razor pages, you can either use one of the full editions of Visual Studio or the free Visual Web Developer Express edition.

Two particularly useful features that Visual Studio provides for programming with ASP.NET Razor web pages are:

- *IntelliSense*. This improves your programming productivity by completing statements and by listing information about the classes and methods that you're working with in the editor. (WebMatrix includes IntelliSense for some programming elements, like HTML and CSS, but not for programming code in C# or Visual Basic.)
- *Debugger*. The debugger lets you troubleshoot your code by stopping a program while it's running, examining variables, and stepping through the code line by line.

These features are currently available only in Visual Studio.

Installing the ASP.NET Razor Tools

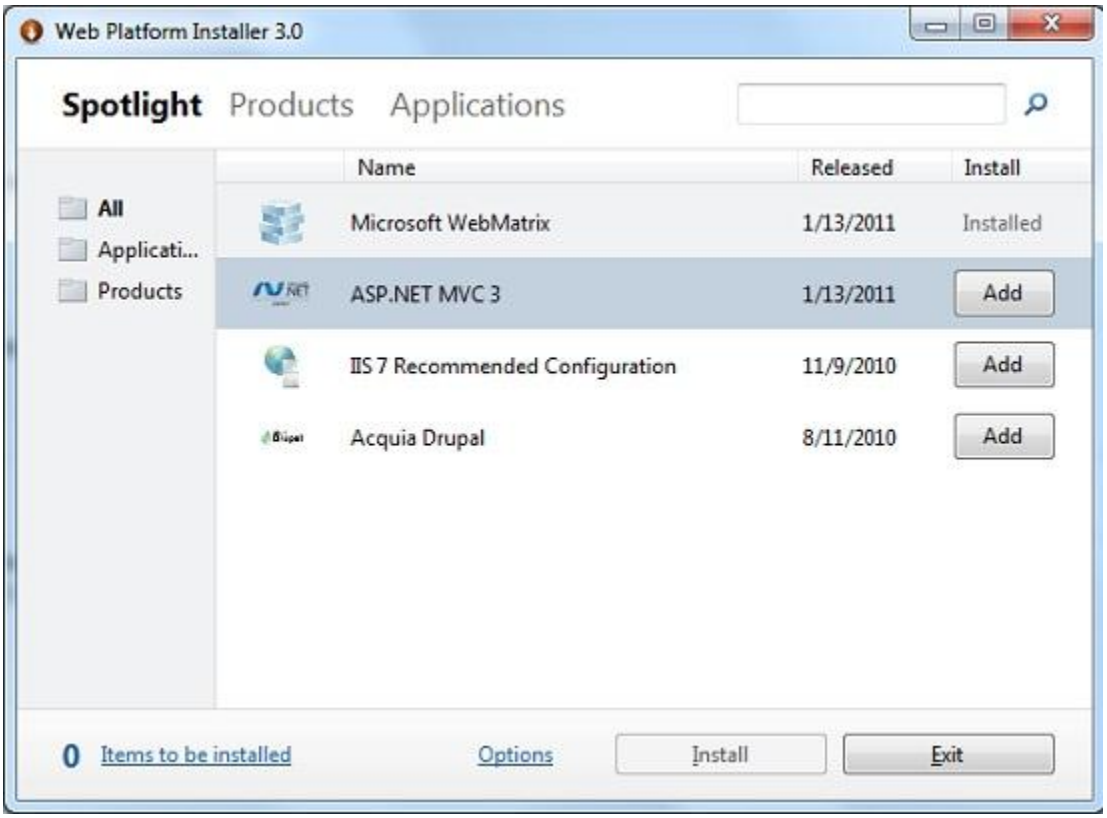
This section shows how to install Visual Web Developer Express 2010 and the ASP.NET Web Pages Tools for Visual Studio.

1. If you don't already have the Web Platform Installer, download it from the following URL:

   http://www.microsoft.com/web/downloads/platform.aspx

2. Run the Web Platform Installer.

3. If you don't already have Visual Studio or Visual Web Developer Express installed, find **Visual Web Developer Express** and then click **Add.**
4. Find **ASP.NET MVC 3**, and then click **Add**. This product includes Visual Studio tools for building ASP.NET Razor websites.

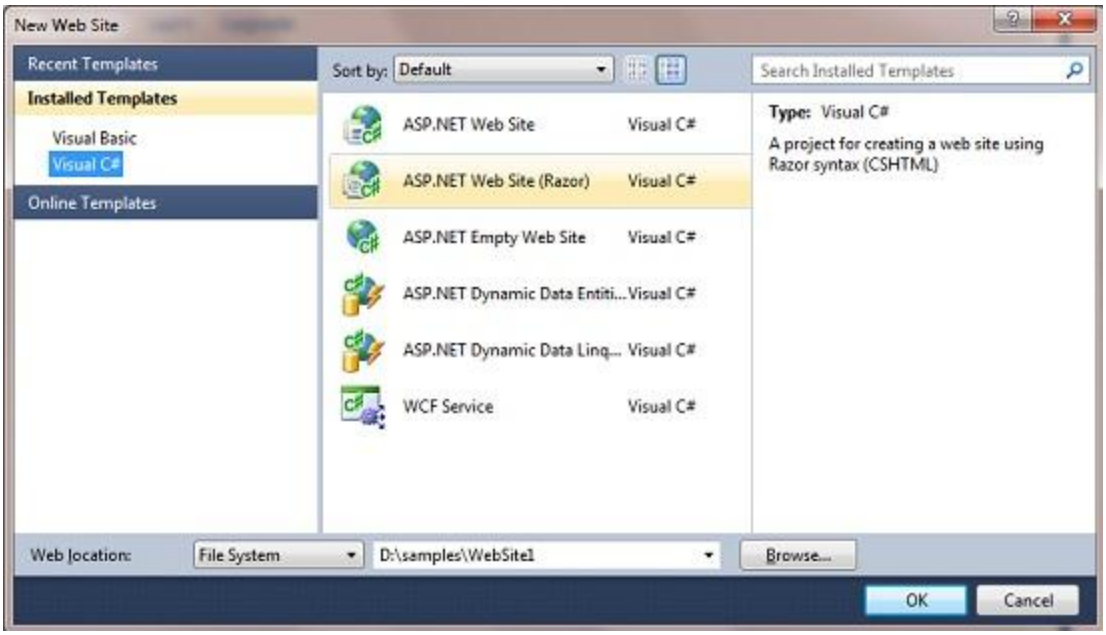


5. Click **Install** to complete the installation.

Using the ASP.NET Razor Tools for Visual Studio

To use IntelliSense and the debugger, you need to create an ASP.NET Razor website in Visual Studio.

1. Start Visual Studio or Visual Web Developer.
2. In the **File** menu, click **New Web Site**.
3. In the **New Web Site** dialog box, select the language to use (Visual C# or Visual Basic).
4. Select the **ASP.NET Web Site (Razor)** template.
5. In the drop-down list near **Web locations**, select **File System**, and for the path, enter a local folder.

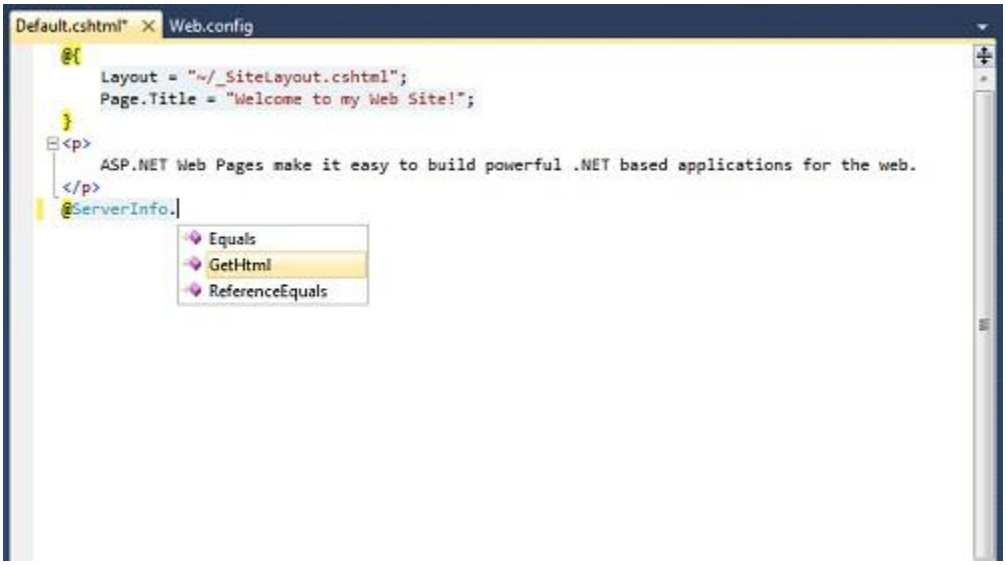


6. Click **OK**.

Using IntelliSense

Now that you've created a site, you can see how IntelliSense works in Visual Studio.

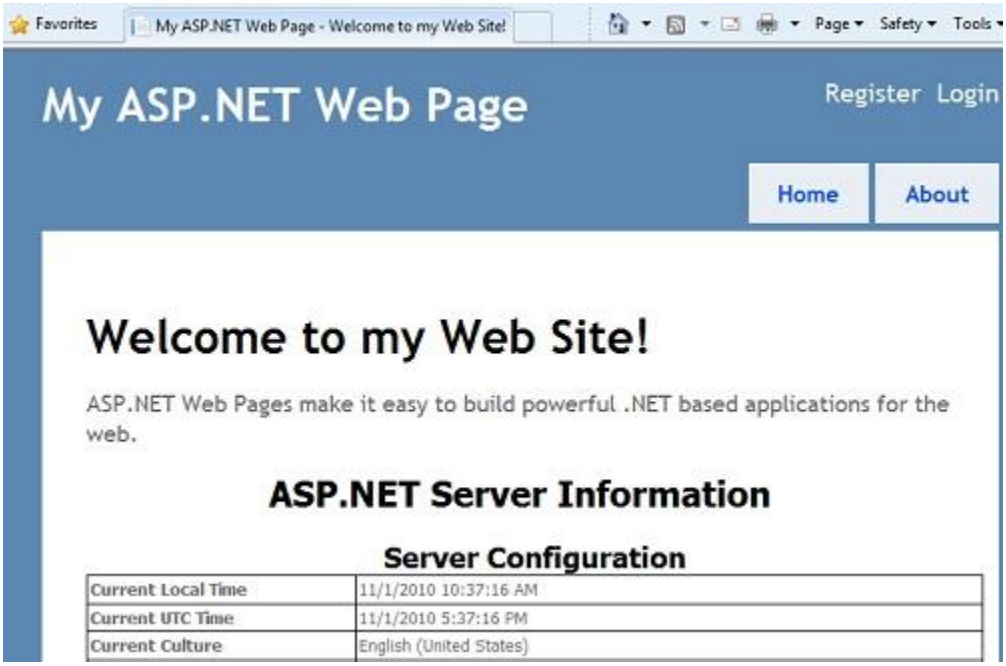
1. In the website you just created, open the *Default.cshtml* page. At the bottom of the window, make sure the **Source** tab is selected.
2. After the closing `</p>` tag in the page, type `@ServerInfo.` (including the dot). Notice how IntelliSense displays the available methods for the `ServerInfo` helper in a drop-down list.



3. Select the `GetHtml` method from the list and then press Enter. IntelliSense automatically fills in the method. (As with any method in C#, you must add `()` characters after the method.)
   The completed code for the `GetHtml` method looks like the following example:

   ```
   @Server.GetHtml()
   ```

4. Press Ctrl+F5 to run the page. This is what the page looks like when displayed in a browser:



5. Close the browser, and then save the updated *Default.cshtml* page.

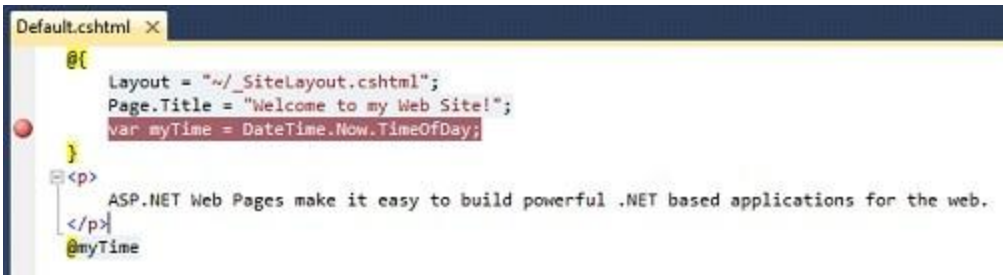
Using the Debugger

1. At the top of the *Default.cshtml* page, after the line that begins with `Page.Title`, add the following line of code:

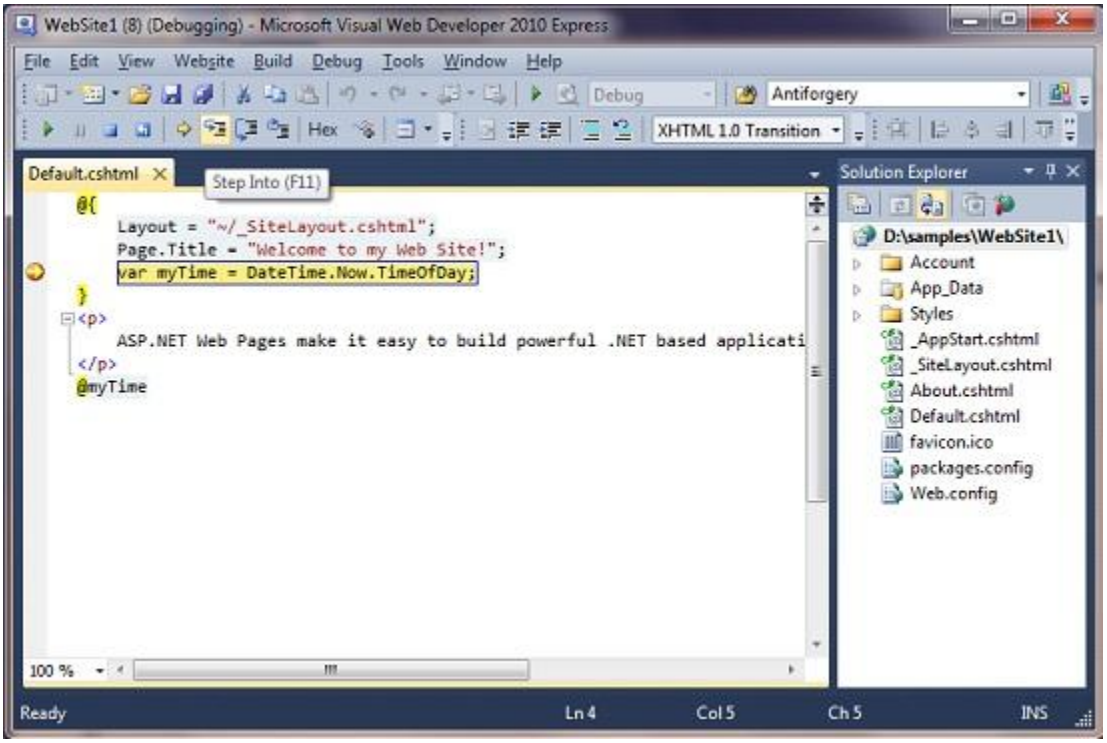
   ```
   var myTime = DateTime.Now.TimeOfDay;
   ```

2. In the gray margin of the editor to the left of the code, click next to this new line in order to add a *breakpoint*. A breakpoint is a marker that tells the debugger to stop running the program at that point so you can see what's happening.
3. Remove the call to the `ServerInfo.GetHtml` method, and add a call to the `@myTime` variable in its place. This call displays the current time value that's returned by the new line of code.

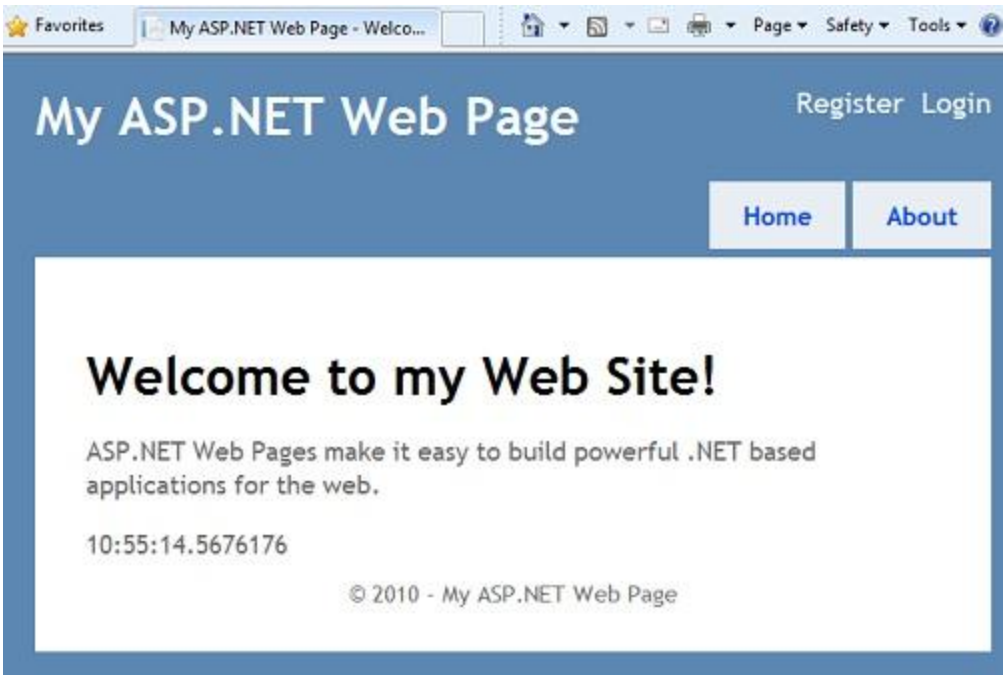
   The updated page with the two new lines of code and the breakpoint looks like the following:



4. Press F5 to run the page in the debugger. The page stops on the breakpoint that you set. The following image shows what the page looks like in the editor with the breakpoint (in yellow), the **Debug** toolbar, and the **Step Into** button.



5. Click the **Step Into** button (or press F11). This runs the next line of code. Pressing F11 again moves to the next line of executable code, and so on.
6. Examine the value of the `myTime` variable by holding your mouse pointer over it or by inspecting the values displayed in the **Locals** and **Call Stack** windows.
7. When you're done examining the variable and stepping through code, press F5 to continue running the page without stopping at each line. This is what the page looks like when displayed in a browser:



To learn more about the debugger and about how to debug code in Visual Studio, see Walkthrough: Debugging Web Pages in Visual Web Developer.

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