CHAPTER 22

Using Controllers with Views, Part II

In this chapter, I describe more of the features provided by Razor views. I show you how to pass additional data to a view using the view bang and how to use layouts and layout sections to reduce duplication. I also explain how the results from expressions are encoded and how to disable the encoding process. Table 22-1 summarizes the chapter.

Table 22-1. *Chapter Summary*

Problem	Solution	Listing
Providing unstructured data to a view	Use the view bag	5, 6
Providing temporary data to a view	Use temp data	7, 8
Using the same content in multiple views	Use a layout	9–12, 15–18
Selecting the default layout for views	Use a view start file	13, 14
Interleaving unique and common content	Use layout sections	19–24
Creating reusable sections of content	Use a partial view	25–29
Inserting HTML into a response using a Razor expression	Encode the HTML	30–32
Including JSON in a view	Use the JSON encoder	33

Preparing for This Chapter

This chapter uses the WebApp project from Chapter 21. To prepare for this chapter, replace the contents of the `HomeController.cs` file with the code shown in Listing 22-1.

Listing 22-1. The Contents of the HomeController.cs File in the Controllers Folder

```
using Microsoft.AspNetCore.Mvc;
using System.Threading.Tasks;
using WebApp.Models;

namespace WebApp.Controllers {

    public class HomeController: Controller {
        private DataContext context;

        public HomeController(DataContext ctx) {
            context = ctx;
        }

        public async Task<IActionResult> Index(long id = 1) {
            return View(await context.Products.FindAsync(id));
        }
```

A. Freeman, *Pro ASP.NET Core 3*, https://doi.org/10.1007/978-1-4842-5440-0_22

```
        public IActionResult List() {
            return View(context.Products);
        }
    }
}
```

One of the features used in this chapter requires the session feature, which was described in Chapter 16. To enable sessions, add the statements shown in Listing 22-2 to the `Startup` class.

Listing 22-2. Enabling Sessions in the Startup.cs File in the WebApp Folder

```
using System;
using System.Collections.Generic;
using System.Linq;
using Microsoft.AspNetCore.Builder;
using Microsoft.Extensions.DependencyInjection;
using Microsoft.Extensions.Configuration;
using Microsoft.EntityFrameworkCore;
using WebApp.Models;

namespace WebApp {
    public class Startup {

        public Startup(IConfiguration config) {
            Configuration = config;
        }

        public IConfiguration Configuration { get; set; }

        public void ConfigureServices(IServiceCollection services) {
            services.AddDbContext<DataContext>(opts => {
                opts.UseSqlServer(Configuration[
                    "ConnectionStrings:ProductConnection"]);
                opts.EnableSensitiveDataLogging(true);
            });
            services.AddControllersWithViews().AddRazorRuntimeCompilation();

            services.AddDistributedMemoryCache();
            services.AddSession(options => {
                options.Cookie.IsEssential = true;
            });
        }

        public void Configure(IApplicationBuilder app, DataContext context) {
            app.UseDeveloperExceptionPage();
            app.UseStaticFiles();
            app.UseSession();
            app.UseRouting();
            app.UseEndpoints(endpoints => {
                endpoints.MapControllers();
                endpoints.MapDefaultControllerRoute();
            });
            SeedData.SeedDatabase(context);
        }
    }
}
```

Dropping the Database

Open a new PowerShell command prompt, navigate to the folder that contains the `WebApp.csproj` file, and run the command shown in Listing 22-3 to drop the database.

■ **Tip** You can download the example project for this chapter—and for all the other chapters in this book—from `https://github.com/apress/pro-asp.net-core-3`. See Chapter 1 for how to get help if you have problems running the examples.

Listing 22-3. Dropping the Database

```
dotnet ef database drop --force
```

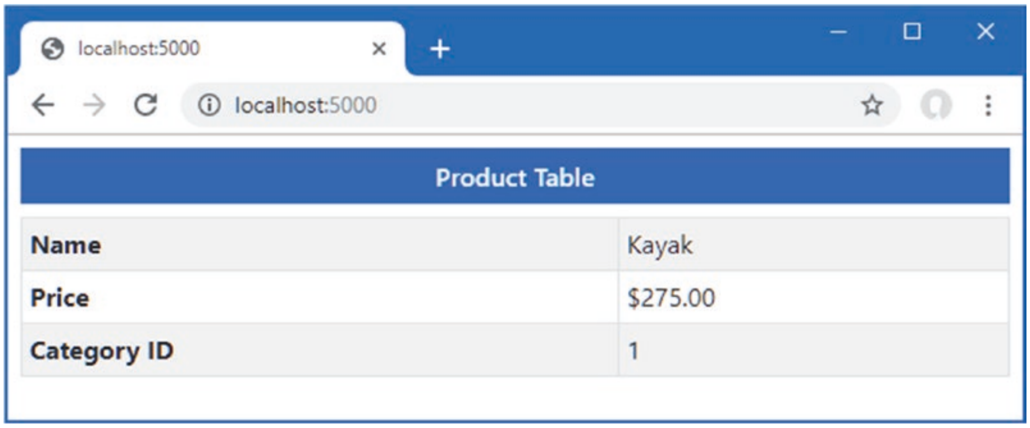
Running the Example Application

Once the database has been dropped, select Start Without Debugging or Run Without Debugging from the Debug menu, or use the PowerShell command prompt to run the command shown in Listing 22-4.

Listing 22-4. Running the Example Application

```
dotnet run
```

The database will be seeded as part of the application startup. Once ASP.NET Core is running, use a web browser to request `http://localhost:5000`, which will produce the response shown in Figure 22-1.



Product Table

Name	Kayak
Price	$275.00
Category ID	1

Figure 22-1. *Running the example application*

Using the View Bag

Action methods provide views with data to display with a view model, but sometimes additional information is required. Action methods can use the *view bag* to provide a view with extra data, as shown in Listing 22-5.

Listing 22-5. Using the View Bag in the HomeController.cs File in the Controllers Folder

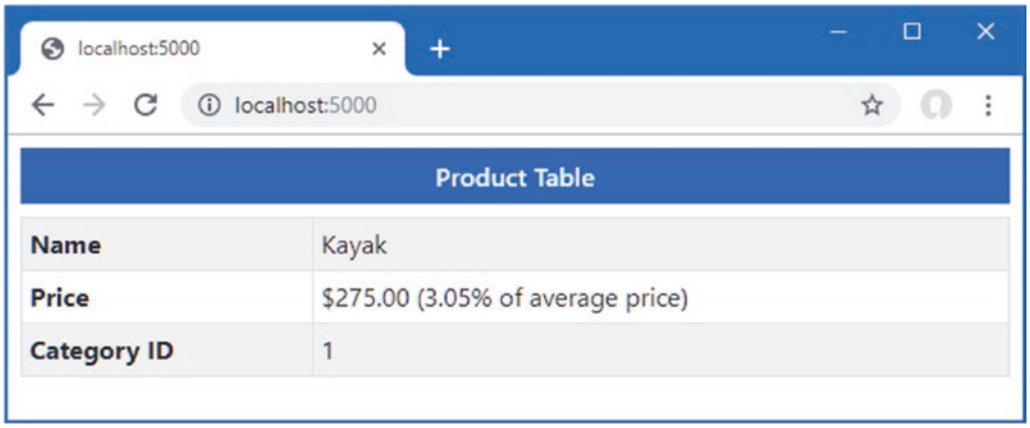
```
using Microsoft.AspNetCore.Mvc;
using System.Threading.Tasks;
using WebApp.Models;
using Microsoft.EntityFrameworkCore;

namespace WebApp.Controllers {

    public class HomeController: Controller {
        private DataContext context;

        public HomeController(DataContext ctx) {
            context = ctx;
        }

        public async Task<IActionResult> Index(long id = 1) {
            ViewBag.AveragePrice = await context.Products.AverageAsync(p => p.Price);
            return View(await context.Products.FindAsync(id));
        }

        public IActionResult List() {
            return View(context.Products);
        }
    }
}
```

The ViewBag property is inherited from the Controller base class and returns a dynamic object. This allows action methods to create new properties just by assigning values to them, as shown in the listing. The values assigned to the ViewBag property by the action method are available to the view through a property also called ViewBag, as shown in Listing 22-6.

Listing 22-6. Using the View Bag in the Index.cshtml File in the Views/Home Folder

```
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-primary text-white text-center m-2 p-2">Product Table</h6>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <tbody>
                <tr><th>Name</th><td>@Model.Name</td></tr>
                <tr>
                    <th>Price</th>
                    <td>
                        @Model.Price.ToString("c")
                        (@(((Model.Price / ViewBag.AveragePrice)
                            * 100).ToString("F2"))% of average price)
                    </td>
                </tr>
                <tr><th>Category ID</th><td>@Model.CategoryId</td></tr>
            </tbody>
        </table>
    </div>
</body>
</html>
```

The ViewBag property conveys the object from the action to the view, alongside the view model object. In the listing, the action method queries for the average of the Product.Price properties in the database and assigns it to a view bag property named AveragePrice, which the view uses in an expression. Restart ASP.NET Core and use a browser to request http://localhost:5000, which produces the response shown in Figure 22-2.



Product Table

Name	Kayak
Price	$275.00 (3.05% of average price)
Category ID	1

Figure 22-2. Using the view bag

WHEN TO USE THE VIEW BAG

The view bag works best when it is used to provide the view with small amounts of supplementary data without having to create new view model classes for each action method. The problem with the view bag is that the compiler cannot check the use of the properties on dynamic objects, much like views that don't use an @model expression. It can be difficult to judge when a new view model class should be used, and my rule of thumb is to create a new view model class when the same view model property is used by multiple actions or when an action method adds more than two or three properties to the view bag.

Using Temp Data

The temp data feature allows a controller to preserve data from one request to another, which is useful when performing redirections. Temp data is stored using a cookie unless session state is enabled when it is stored as session data. Unlike session data, temp data values are marked for deletion when they are read and removed when the request has been processed.

Add a class file called CubedController.cs to the WebApp/Controllers folder and use it to define the controller shown in Listing 22-7.

Listing 22-7. The Contents of the CubedController.cs File in the Controllers Folder

```
using Microsoft.AspNetCore.Mvc;
using System;

namespace WebApp.Controllers {
    public class CubedController: Controller {

        public IActionResult Index() {
            return View("Cubed");
        }

        public IActionResult Cube(double num) {
            TempData["value"] = num.ToString();
            TempData["result"] = Math.Pow(num, 3).ToString();
            return RedirectToAction(nameof(Index));
        }
    }
}
```

The Cubed controller defines an Index method that selects a view named Cubed. There is also a Cube action, which relies on the model binding process to obtain a value for its num parameter from the request (a process described in detail in Chapter 28). The Cubed action method performs its calculation and stores the num value and the calculation result using TempData property, which returns a dictionary that is used to store key/value pairs. Since the temp data feature is built on top of the sessions feature, only values that can be serialized to strings can be stored, which is why I convert both double values to strings in Listing 22-7. Once the values are stored as temp data, the Cube method performs a redirection to the Index method. To provide the controller with a view, add a Razor view file named Cubed.cshtml to the WebApp/Views/Shared folder with the content shown in Listing 22-8.

Listing 22-8. The Contents of the Cubed.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-secondary text-white text-center m-2 p-2">Cubed</h6>
    <form method="get" action="/cubed/cube" class="m-2">
        <div class="form-group">
            <label>Value</label>
            <input name="num" class="form-control" value="@(TempData["value"])" />
        </div>
        <button class="btn btn-primary" type="submit">Submit</button>
    </form>
    @if (TempData["result"] != null) {
        <div class="bg-info text-white m-2 p-2">
            The cube of @TempData["value"] is @TempData["result"]
        </div>
    }
</body>
</html>
```

The base class used for Razor views provides access to the temp data through a TempData property, allowing values to be read within expressions. In this case, temp data is used to set the content of an input element and display a results summary. Reading a temp data value doesn't remove it immediately, which means that values can be read repeatedly in the same view. It is only once the request has been processed that the marked values are removed.

To see the effect, restart ASP.NET Core, use a browser to navigate to http://localhost:5000/cubed, enter a value into the form field, and click the Submit button. The browser will send a request that will set the temp data and trigger the redirection. The temp data values are preserved for the new request, and the results are displayed to the user. But reading the data values marks them for deletion, and if you reload the browser, the contents of the input element and the results summary are no longer displayed, as shown in Figure 22-3.

■ **Tip** The object returned by the TempData property provides a Peek method, which allows you to get a data value without marking it for deletion, and a Keep method, which can be used to prevent a previously read value from being deleted. The Keep method doesn't protect a value forever. If the value is read again, it will be marked for removal once more. Use session data if you want to store items so that they won't be removed when the request is processed.

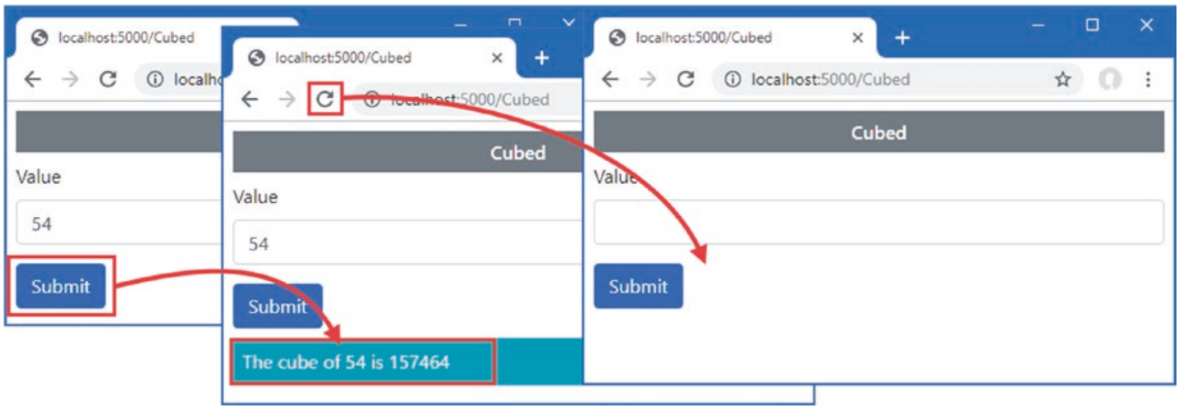


Figure 22-3. *Using temp data*

USING THE TEMP DATA ATTRIBUTE

Controllers can define properties that are decorated with the `TempData` attribute, which is an alternative to using the `TempData` property, like this:

```
using Microsoft.AspNetCore.Mvc;
using System;

namespace WebApp.Controllers {
    public class CubedController: Controller {

        public IActionResult Index() {
            return View("Cubed");
        }

        public IActionResult Cube(double num) {
            Value = num.ToString();
            Result = Math.Pow(num, 3).ToString();
            return RedirectToAction(nameof(Index));
        }

        [TempData]
        public string Value { get; set; }

        [TempData]
        public string Result { get; set; }
    }
}
```

The values assigned to these properties are automatically added to the temp data store, and there is no difference in the way they are accessed in the view. My preference is to use the `TempData` dictionary to store values because it makes the intent of the action method obvious to other developers. However, both approaches are entirely valid, and choosing between them is a matter of preference.

Working with Layouts

The views in the example application contain duplicate elements that deal with setting up the HTML document, defining the head section, loading the Bootstrap CSS file, and so on. Razor supports *layouts*, which avoid this sort of duplication by consolidating common content in a single file that can be used by any view.

Layouts are typically stored in the `Views/Shared` folder because they are usually used by the action methods of more than one controller. If you are using Visual Studio, right-click the `Views/Shared` folder, select Add ➤ New Item from the popup menu, and choose the Razor Layout template, as shown in Figure 22-4. Make sure the name of the file is `_Layout.cshtml` and click the Add button to create the new file. Replace the content added to the file by Visual Studio with the elements shown in Listing 22-9.

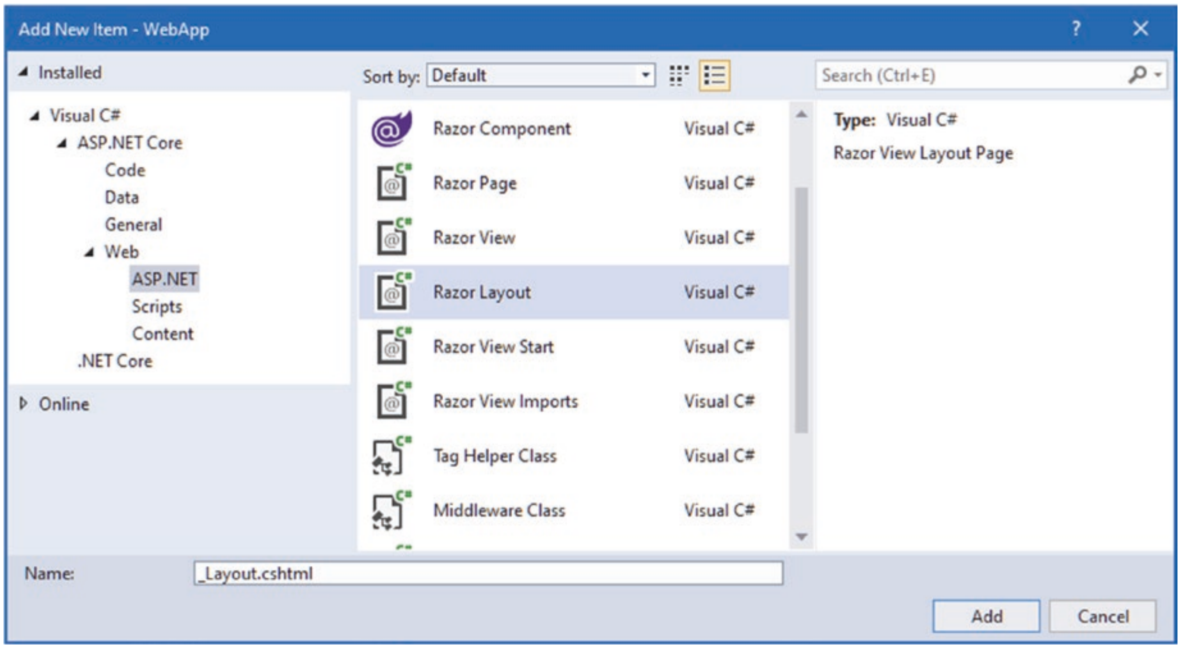


Figure 22-4. *Creating a layout*

If you are using Visual Studio Code, create a file named `_Layout.cshtml` in the `Views/Shared` folder and add the content shown in Listing 22-9.

Listing 22-9. The Contents of the _Layout.cshtml File in the Views/Shared Folder

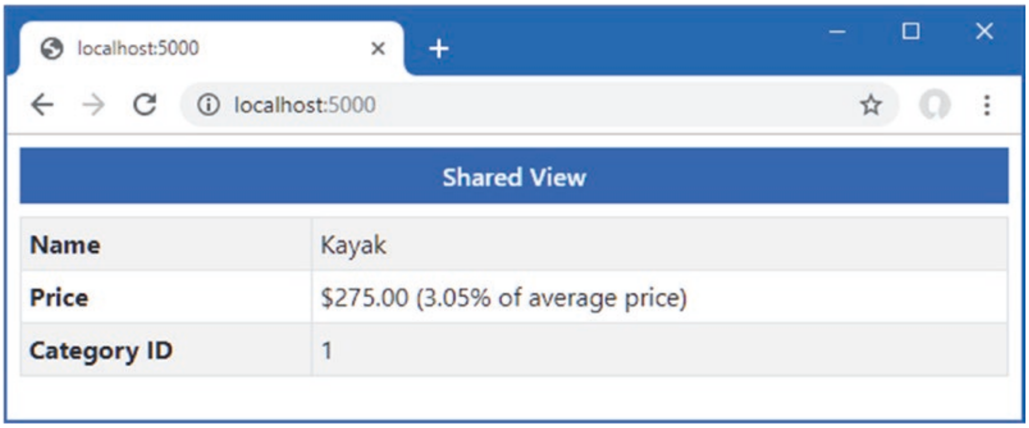
```
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-primary text-white text-center m-2 p-2">Shared View</h6>
    @RenderBody()
</body>
</html>
```

The layout contains the common content that will be used by multiple views. The content that is unique to each view is inserted into the response by calling the `RenderBody` method, which is inherited by the `RazorPage<T>` class, as described in Chapter 21. Views that use layouts can focus on just their unique content, as shown in Listing 22-10.

Listing 22-10. Using a Layout in the Index.cshtml File in the Views/Home Folder

```
@model Product
@{
    Layout = "_Layout";
}
<div class="m-2">
    <table class="table table-sm table-striped table-bordered">
        <tbody>
            <tr><th>Name</th><td>@Model.Name</td></tr>
            <tr>
                <th>Price</th>
                <td>
                    @Model.Price.ToString("c")
                    (@(((Model.Price / ViewBag.AveragePrice)
                        * 100).ToString("F2"))% of average price)
                </td>
            </tr>
            <tr><th>Category ID</th><td>@Model.CategoryId</td></tr>
        </tbody>
    </table>
</div>
```

The layout is selected by adding a code block, denoted by the `@{` and `}` characters, that sets the `Layout` property inherited from the `RazorPage<T>` class. In this case, the `Layout` property is set to the name of the layout file. As with normal views, the layout is specified without a path or file extension, and the Razor engine will search in the `/Views/[controller]` and `/Views/Shared` folders to find a matching file. Use the browser to request `http://localhost:5000`, and you will see the response shown in Figure 22-5.



Shared View

Name	Kayak
Price	$275.00 (3.05% of average price)
Category ID	1

Figure 22-5. *Using a layout*

Configuring Layouts Using the View Bag

The view can provide the layout with data values, allowing the common content provided by the view to be customized. The view bag properties are defined in the code block that selects the layout, as shown in Listing 22-11.

Listing 22-11. Setting a View Bag Property in the Index.cshtml File in the Views/Home Folder

```
@model Product
@{
    Layout = "_Layout";
    ViewBag.Title = "Product Table";
}
```

```
<div class="m-2">
    <table class="table table-sm table-striped table-bordered">
        <tbody>
            <tr><th>Name</th><td>@Model.Name</td></tr>
            <tr>
                <th>Price</th>
                <td>
                    @Model.Price.ToString("c")
                    (@(((Model.Price / ViewBag.AveragePrice)
                        * 100).ToString("F2"))% of average price)
                </td>
            </tr>
            <tr><th>Category ID</th><td>@Model.CategoryId</td></tr>
        </tbody>
    </table>
</div>
```

The view sets a `Title` property, which can be used in the layout, as shown in Listing 22-12.

Listing 22-12. Using a View Bag Property in the _Layout.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <title>@ViewBag.Title</title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-primary text-white text-center m-2 p-2">
        @(ViewBag.Title ?? "Layout")
    </h6>
    @RenderBody()
</body>
</html>
```

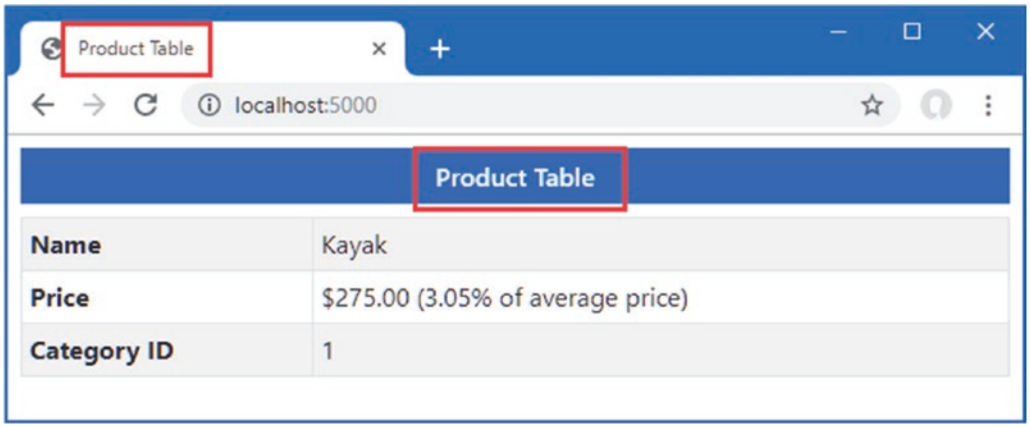
The `Title` property is used to set the content of the `title` element and `h6` element in the body section. Layouts cannot rely on view bag properties being defined, which is why the expression in the `h6` element provides a fallback value if the view doesn't define a `Title` property. To see the effect of the view bag property, use a browser to request `http://localhost:5000`, which produces the response shown in Figure 22-6.

UNDERSTANDING VIEW BAG PRECEDENCE

The values defined by the view take precedence if the same view bag property is defined by the view and the action method. If you want to allow the action to override the value defined in the view, then use a statement like this in the view code block:

```
...
@{
    Layout = "_Layout";
    ViewBag.Title = ViewBag.Title ?? "Product Table";
}
...
```

This statement will set the value for the `Title` property only if it has not already been defined by the action method.



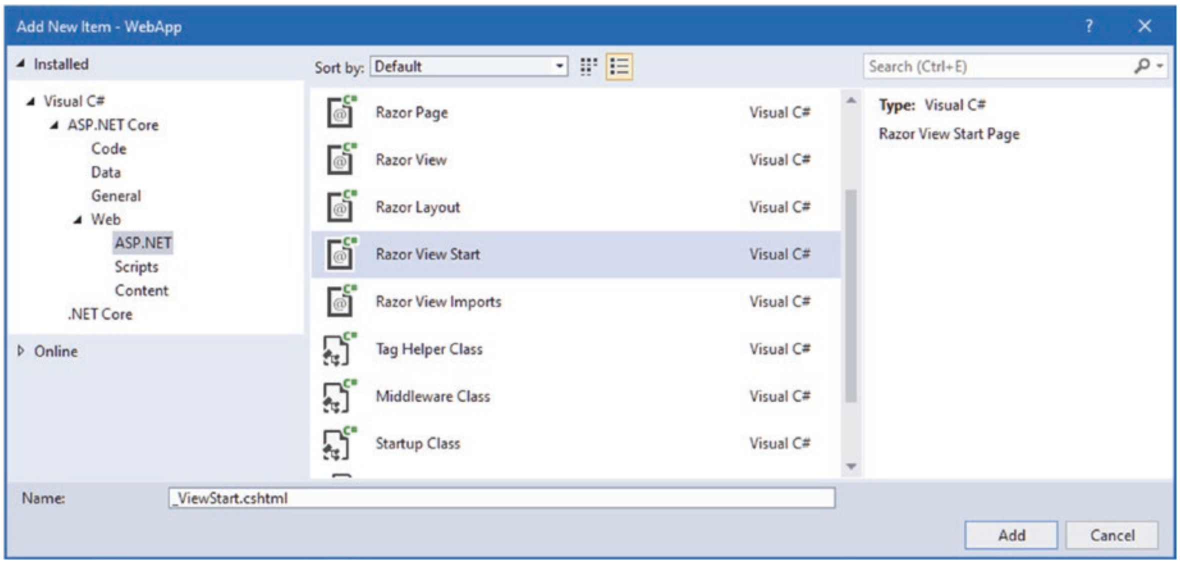
Product Table

Name	Kayak
Price	$275.00 (3.05% of average price)
Category ID	1

Figure 22-6. *Using a view bag property to configure a layout*

Using a View Start File

Instead of setting the `Layout` property in every view, you can add a *view start* file to the project that provides a default `Layout` value. If you are using Visual Studio, right-click the `Views` folder item in the Solution Explorer, select Add ➤ New Item, and locate the Razor View Start template, as shown in Figure 22-7. Make sure the name of the file is `_ViewStart.cshtml` and click the Add button to create the file, which will have the content shown in Listing 22-13.



Name: _ViewStart.cshtml

Figure 22-7. *Creating a view start file*

If you are using Visual Studio Code, then add a file named `_ViewStart.cshtml` to the `Views` folder and add the content shown in Listing 22-13.

Listing 22-13. The Contents of the _ViewStart.cshtml File in the Views Folder

```
@{
    Layout = "_Layout";
}
```

The file contains sets the `Layout` property, and the value will be used as the default. Listing 22-14 removes the content from the `Common.cshtml` file that is contained in the layout.

Listing 22-14. Removing Content in the Common.cshtml File in the Views/Shared Folder

```
<h6 class="bg-secondary text-white text-center m-2 p-2">Shared View</h6>
```

The view doesn't define a view model type and doesn't need to set the `Layout` property because the project contains a view start file. The result is that the content in Listing 22-14 will be added to the body section of the HTML content of the response. Use a browser to navigate to `http://localhost:5000/second`, and you will see the response in Figure 22-8.

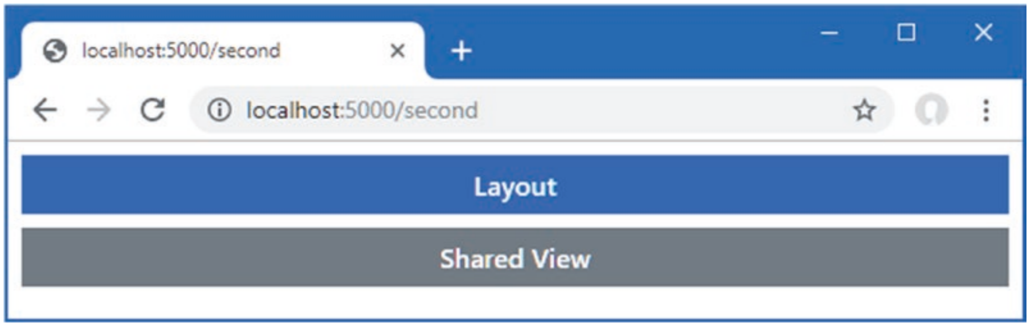


Figure 22-8. *Using a view start file*

Overriding the Default Layout

There are two situations where you may need to define a `Layout` property in a view even when there is a view start file in the project. In the first situation, a view requires a different layout from the one specified by the view start file. To demonstrate, add a Razor layout file named `_ImportantLayout.cshtml` to the `Views/Shared` folder with the content shown in Listing 22-15.

Listing 22-15. The Contents of the _ImportantLayout.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <title>@ViewBag.Title</title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h3 class="bg-warning text-white text-center p-2 m-2">Important</h3>
    @RenderBody()
</body>
</html>
```

In addition to the HTML document structure, this file contains a header element that displays `Important` in large text. Views can select this layout by assigning its name to the `Layout` property, as shown in Listing 22-16.

■ **Tip** If you need to use a different layout for all the actions of a single controller, then add a view start file to the `Views/[controller]` folder that selects the view you require. The Razor engine will use the layout specified by the controller-specific view start file.

Listing 22-16. Using a Specific Layout in the Index.cshtml File in the Views/Home Folder

```
@model Product
@{
    Layout = "_ImportantLayout";
    ViewBag.Title = ViewBag.Title ?? "Product Table";
}
<div class="m-2">
    <table class="table table-sm table-striped table-bordered">
        <tbody>
            <tr><th>Name</th><td>@Model.Name</td></tr>
            <tr>
                <th>Price</th>
                <td>
                    @Model.Price.ToString("c")
                    (@(((Model.Price / ViewBag.AveragePrice)
                        * 100).ToString("F2"))% of average price)
                </td>
            </tr>
            <tr><th>Category ID</th><td>@Model.CategoryId</td></tr>
        </tbody>
    </table>
</div>
```

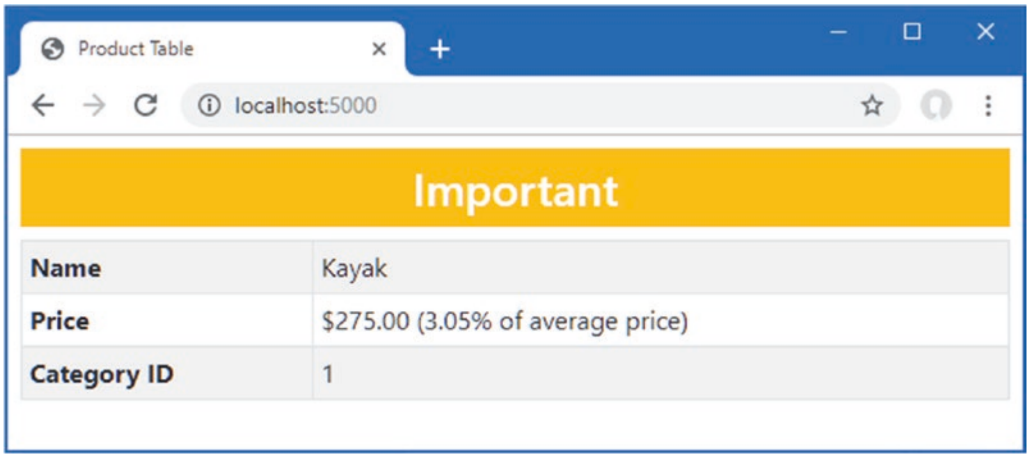
The `Layout` value in the view start file is overridden by the value in the view, allowing different layouts to be applied. Use a browse to request `http://localhost:5000`, and the response will be produced using the new layout, as shown in Figure 22-9.

SELECTING A LAYOUT PROGRAMMATICALLY

The value that a view assigns to the `Layout` property can be the result of an expression that allows layouts to be selected by the view, similar to the way that action methods can select views. Here is an example that selects the layout based on a property defined by the view model object:

```
...
@model Product
@{
    Layout = Model.Price > 100 ? "_ImportantLayout" : "_Layout";
    ViewBag.Title = ViewBag.Title ?? "Product Table";
}
...
```

The layout named `_ImportantLayout` is selected when the value of the view model object's `Price` property is greater than 100; otherwise, `_Layout` is used.



Important

Name	Kayak
Price	$275.00 (3.05% of average price)
Category ID	1

Figure 22-9. *Specifying a layout in a view*

The second situation where a Layout property can be needed is when a view contains a complete HTML document and doesn't require a layout at all. To see the problem, open a new PowerShell command prompt and run the command shown in Listing 22-17.

Listing 22-17. Sending an HTTP Request

```
Invoke-WebRequest http://localhost:5000/home/list | Select-Object  -expand Content
```

This command sends an HTTP GET request whose response will be produced using the `List.cshtml` file in the `Views/Home` folder. This view contains a complete HTML document, which is combined with the content in the view specified by the view start file, producing a malformed HTML document, like this:

```
<!DOCTYPE html>
<html>
<head>
    <title></title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-primary text-white text-center m-2 p-2">
        Layout
    </h6>
    <!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-secondary text-white text-center m-2 p-2">Products</h6>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <thead>
                <tr><th>Name</th><th>Price</th></tr>
            </thead>
            <tbody>
                    <tr><td>Kayak</td><td>275.00</td></tr>
                    <tr><td>Lifejacket</td><td>48.95</td></tr>
                    <tr><td>Soccer Ball</td><td>19.50</td></tr>
                    <tr><td>Corner Flags</td><td>34.95</td></tr>
                    <tr><td>Stadium</td><td>79500.00</td></tr>
                    <tr><td>Thinking Cap</td><td>16.00</td></tr>
                    <tr><td>Unsteady Chair</td><td>29.95</td></tr>
                    <tr><td>Human Chess Board</td><td>75.00</td></tr>
                    <tr><td>Bling-Bling King</td><td>1200.00</td></tr>
            </tbody>
        </table>
    </div>
</body>
</html>
</body>
</html>
```

The structural elements for the HTML document are duplicated, so there are two `html`, `head`, `body`, and `link` elements. Browsers are adept at handling malformed HTML but don't always cope with poorly structured content. Where a view contains a complete HTML document, the `Layout` property can be set to null, as shown in Listing 22-18.

Listing 22-18. Disabling Layouts in the List.cshtml File in the Views/Home Folder

```
@model IEnumerable<Product>
@{
    Layout = null;
}
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-secondary text-white text-center m-2 p-2">Products</h6>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <thead>
                <tr><th>Name</th><th>Price</th></tr>
            </thead>
            <tbody>
                @foreach (Product p in Model) {
                    <tr><td>@p.Name</td><td>@p.Price</td></tr>
                }
            </tbody>
        </table>
    </div>
</body>
</html>
```

Save the view and run the command shown in Listing 22-17 again, and you will see that the response contains only the elements in the view and that the layout has been disabled.

```
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-secondary text-white text-center m-2 p-2">Products</h6>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
```

```
            <thead>
                <tr><th>Name</th><th>Price</th></tr>
            </thead>
            <tbody>
                    <tr><td>Kayak</td><td>275.00</td></tr>
                    <tr><td>Lifejacket</td><td>48.95</td></tr>
                    <tr><td>Soccer Ball</td><td>19.50</td></tr>
                    <tr><td>Corner Flags</td><td>34.95</td></tr>
                    <tr><td>Stadium</td><td>79500.00</td></tr>
                    <tr><td>Thinking Cap</td><td>16.00</td></tr>
                    <tr><td>Unsteady Chair</td><td>29.95</td></tr>
                    <tr><td>Human Chess Board</td><td>75.00</td></tr>
                    <tr><td>Bling-Bling King</td><td>1200.00</td></tr>
            </tbody>
        </table>
    </div>
</body>
</html>
```

Using Layout Sections

The Razor view engine supports the concept of *sections*, which allow you to provide regions of content within a layout. Razor sections give greater control over which parts of the view are inserted into the layout and where they are placed. To demonstrate the sections feature, I have edited the /Views/Home/Index.cshtml file, as shown in Listing 22-19.

Listing 22-19. Defining Sections in the Index.cshtml File in the Views/Home Folder

```
@model Product
@{
    Layout = "_Layout";
    ViewBag.Title = ViewBag.Title ?? "Product Table";
}

@section Header {
    Product Information
}

<tr><th>Name</th><td>@Model.Name</td></tr>
<tr>
    <th>Price</th>
    <td>@Model.Price.ToString("c")</td>
</tr>
<tr><th>Category ID</th><td>@Model.CategoryId</td></tr>

@section Footer {
    @(((Model.Price / ViewBag.AveragePrice)
        * 100).ToString("F2"))% of average price
}
```

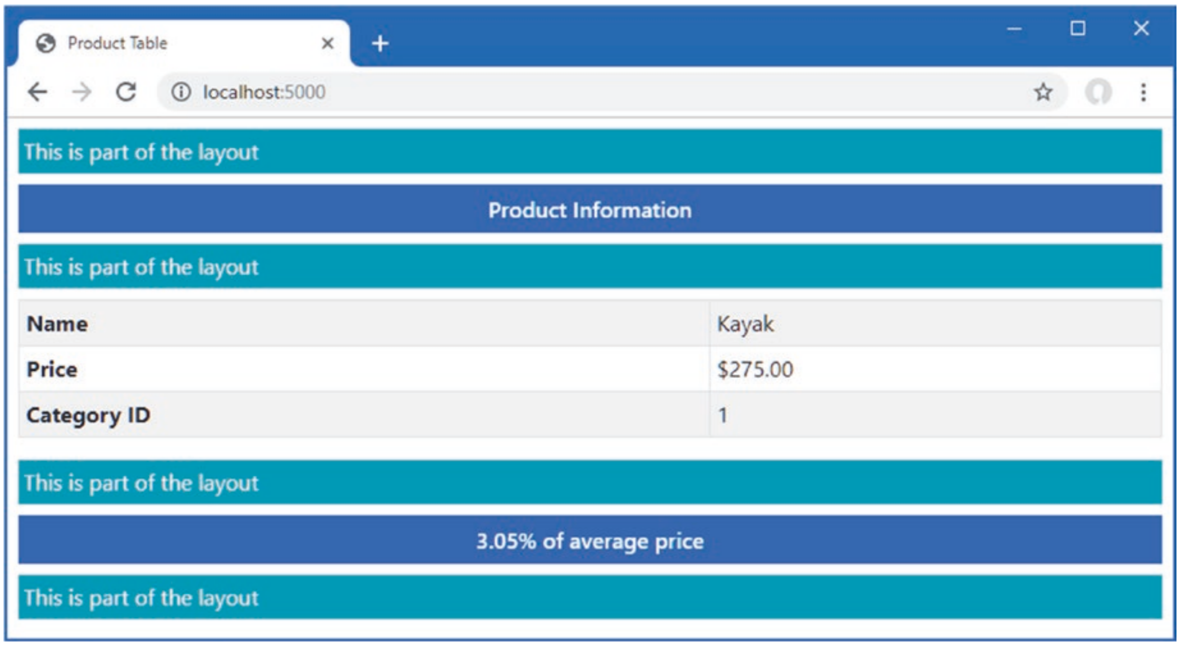
Sections are defined using the Razor @section expression followed by a name for the section. Listing 22-19 defines sections named Header and Footer, and sections can contain the same mix of HTML content and expressions, just like the main part of the view. Sections are applied in a layout with the @RenderSection expression, as shown in Listing 22-20.

Listing 22-20. Using Sections in the _Layout.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <title>@ViewBag.Title</title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <div class="bg-info text-white m-2 p-1">
        This is part of the layout
    </div>

    <h6 class="bg-primary text-white text-center m-2 p-2">
        @RenderSection("Header")
    </h6>

    <div class="bg-info text-white m-2 p-1">
        This is part of the layout
    </div>

    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <tbody>
                @RenderBody()
            </tbody>
        </table>
    </div>

    <div class="bg-info text-white m-2 p-1">
        This is part of the layout
    </div>

    <h6 class="bg-primary text-white text-center m-2 p-2">
        @RenderSection("Footer")
    </h6>

    <div class="bg-info text-white m-2 p-1">
        This is part of the layout
    </div>
</body>
</html>
```

When the layout is applied, the `RenderSection` expression inserts the content of the specified section into the response. The regions of the view that are not contained within a section are inserted into the response by the `RenderBody` method. To see how the sections are applied, use a browser to request `http://localhost:5000`, which provides the response shown in Figure 22-10.

■ **Note** A view can define only the sections that are referred to in the layout. The view engine throws an exception if you define sections in the view for which there is no corresponding `@RenderSection` expression in the layout.



This is part of the layout

Product Information

This is part of the layout

Name	Kayak
Price	$275.00
Category ID	1

This is part of the layout

3.05% of average price

This is part of the layout

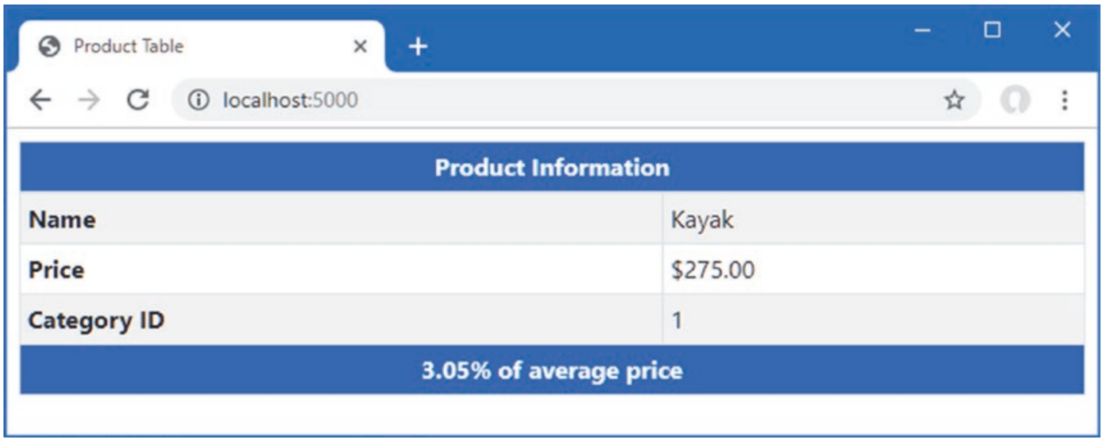
Figure 22-10. *Using sections in a layout*

Sections allow views to provide fragments of content to the layout without specifying how they are used. As an example, Listing 22-21 redefines the layout to consolidate the body and sections into a single HTML table.

Listing 22-21. Using a Table in the _Layout.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <title>@ViewBag.Title</title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <thead>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Header")
                    </th>
                </tr>
            </thead>
            <tbody>
                @RenderBody()
            </tbody>
            <tfoot>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Footer")
                    </th>
                </tr>
            </tfoot>
        </table>
    </div>
</body>
</html>
```

To see the effect of the change to the view, use a browser to request `http://localhost:5000`, which will produce the response shown in Figure 22-11.



Product Information	
Name	Kayak
Price	$275.00
Category ID	1
3.05% of average price	

Figure 22-11. *Changing how sections are displayed in a layout*

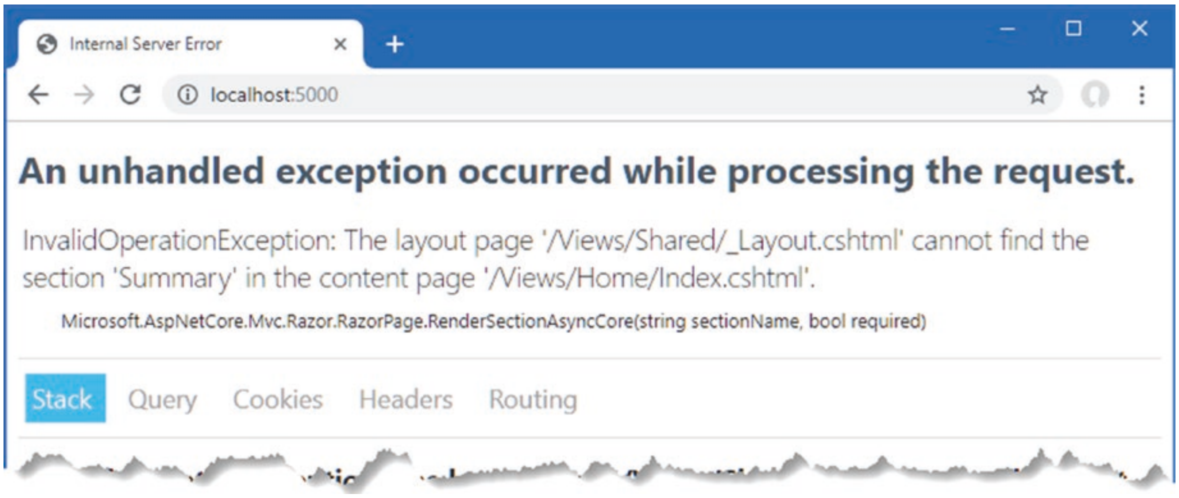
Using Optional Layout Sections

By default, a view must contain all the sections for which there are `RenderSection` calls in the layout, and an exception will be thrown if the layout requires a section that the view hasn't defined. Listing 22-22 adds a call to the `RenderSection` method that requires a section named `Summary`.

Listing 22-22. Adding a Section in the _Layout.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <title>@ViewBag.Title</title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <thead>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Header")
                    </th>
                </tr>
            </thead>
            <tbody>
                @RenderBody()
            </tbody>
            <tfoot>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Footer")
                    </th>
                </tr>
            </tfoot>
        </table>
    </div>
    @RenderSection("Summary")
</body>
</html>
```

Use a browser to request `http://localhost:5000`, and you will see the exception shown in Figure 22-12.



An unhandled exception occurred while processing the request.

InvalidOperationException: The layout page '/Views/Shared/_Layout.cshtml' cannot find the section 'Summary' in the content page '/Views/Home/Index.cshtml'.

Microsoft.AspNetCore.Mvc.Razor.RazorPage.RenderSectionAsyncCore(string sectionName, bool required)

Figure 22-12. *Attempting to render a nonexistent view section*

There are two ways to solve this problem. The first is to create an optional section, which will be rendered only if it is defined by the view. Optional sections are created by passing a second argument to the `RenderSection` method, as shown in Listing 22-23.

Listing 22-23. Defining an Optional Section in the _Layout.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <title>@ViewBag.Title</title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <thead>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Header", false)
                    </th>
                </tr>
            </thead>
            <tbody>
                @RenderBody()
            </tbody>
            <tfoot>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Footer", false)
                    </th>
                </tr>
            </tfoot>
        </table>
    </div>
    @RenderSection("Summary", false)
</body>
</html>
```

The second argument specifies whether a section is required, and using `false` prevents an exception when the view doesn't define the section.

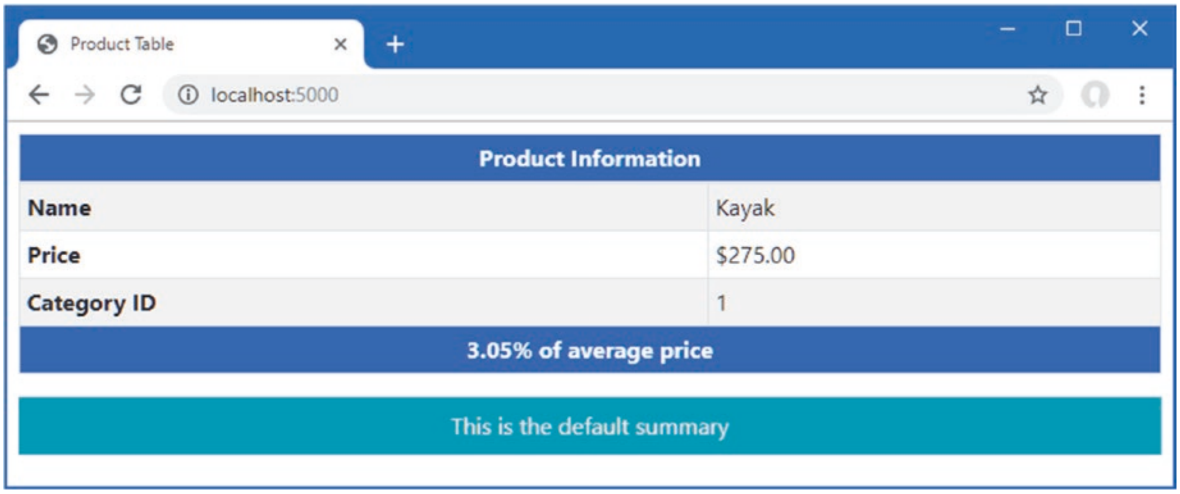
Testing for Layout Sections

The `IsSectionDefined` method is used to determine whether a view defines a specified section and can be used in an `if` expression to render fallback content, as shown in Listing 22-24.

Listing 22-24. Checking for a Section in the _Layout.cshtml File in the Views/Shared Folder

```
<!DOCTYPE html>
<html>
<head>
    <title>@ViewBag.Title</title>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <thead>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Header", false)
                    </th>
                </tr>
            </thead>
            <tbody>
                @RenderBody()
            </tbody>
            <tfoot>
                <tr>
                    <th class="bg-primary text-white text-center" colspan="2">
                        @RenderSection("Footer", false)
                    </th>
                </tr>
            </tfoot>
        </table>
    </div>
    @if (IsSectionDefined("Summary")) {
        @RenderSection("Summary", false)
    } else {
        <div class="bg-info text-center text-white m-2 p-2">
            This is the default summary
        </div>
    }
</body>
</html>
```

The `IsSectionDefined` method is invoked with the name of the section you want to check and returns `true` if the view defines that section. In the example, I used this helper to render fallback content when the view does not define the `Summary` section. To see the fallback content, use a browser to request `http://localhost:5000`, which produces the response shown in Figure 22-13.



Product Information	
Name	Kayak
Price	$275.00
Category ID	1
3.05% of average price	

This is the default summary

Figure 22-13. *Displaying fallback content for a view section*

Using Partial Views

You will often need to use the same set of HTML elements and expressions in several different places. *Partial views* are views that contain fragments of content that will be included in other views to produce complex responses without duplication.

Enabling Partial Views

Partial views are applied using a feature called *tag helpers*, which are described in detail in Chapter 25; tag helpers are configured in the view imports file, which was added to the project in Chapter 21. To enable the feature required for partial views, add the statement shown in Listing 22-25 to the `_ViewImports.cshtml` file.

Listing 22-25. Enabling Tag Helpers in the _ViewImports.cshtml File in the Views Folder

```
@using WebApp.Models
@addTagHelper *, Microsoft.AspNetCore.Mvc.TagHelpers
```

Creating a Partial View

Partial views are just regular CSHTML files, and it is only the way they are used that differentiates them from standard views. If you are using Visual Studio, right-click the `Views/Home` folder, select Add ➤ New Item, and use the Razor View template to create a file named `_RowPartial.cshtml`. Once the file has been created, replace the contents with those shown in Listing 22-26. If you are using Visual Studio Code, add a file named `_RowPartial.cshtml` to the `Views/Home` folder and add to it the content shown in Listing 22-26.

■ **Tip** Visual Studio provides some tooling support for creating prepopulated partial views, but the simplest way to create a partial view is to create a regular view using the Razor View item template.

Listing 22-26. The Contents of the _RowPartial.cshtml File in the Views/Home Folder

```
@model Product

<tr>
    <td>@Model.Name</td>
    <td>@Model.Price</td>
</tr>
```

The `model` expression is used to define the view model type for the partial view, which contains the same mix of expressions and HTML elements as regular views. The content of this partial view creates a table row, using the `Name` and `Price` properties of a `Product` object to populate the table cells.

Applying a Partial View

Partial views are applied by adding a `partial` element in another view or layout. In Listing 22-27, I have added the element to the `List.cshtml` file so the partial view is used to generate the rows in the table.

Listing 22-27. Using a Partial View in the List.cshtml File in the Views/Home Folder

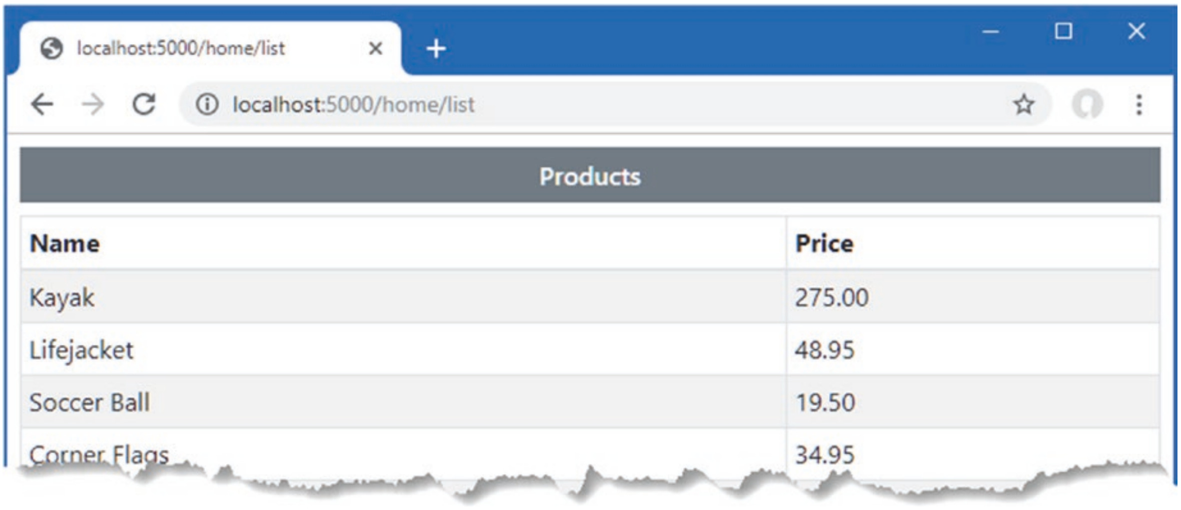
```
@model IEnumerable<Product>
@{
    Layout = null;
}
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <h6 class="bg-secondary text-white text-center m-2 p-2">Products</h6>
    <div class="m-2">
        <table class="table table-sm table-striped table-bordered">
            <thead>
                <tr><th>Name</th><th>Price</th></tr>
            </thead>
            <tbody>
                @foreach (Product p in Model) {
                    <partial name="_RowPartial" model="p" />
                }
            </tbody>
        </table>
    </div>
</body>
</html>
```

The attributes applied to the `partial` element control the selection and configuration of the partial view, as described in Table 22-2.

Table 22-2. *The partial Element Attributes*

Name	Description
`name`	This property specifies the name of the partial view, which is located using the same search process as regular views.
`model`	This property specifies the value that will be used as the view model object for the partial view.
`for`	This property is used to define an expression that selects the view model object for the partial view, as explained next.
`view-data`	This property is used to provide the partial view with additional data.

The `partial` element in Listing 22-27 uses the `name` attribute to select the `_RowPartial` view and the `model` attribute to select the `Product` object that will be used as the view model object. The `partial` element is applied within the `@foreach` expression, which means that it will be used to generate each row in the table, which you can see by using a browser to request `http://localhost:5000/home/list` to produce the response shown in Figure 22-14.



Products

Name	Price
Kayak	275.00
Lifejacket	48.95
Soccer Ball	19.50
Corner Flags	34.95

Figure 22-14. *Using a partial view*

USING THE HTML HELPER TO APPLY PARTIAL VIEWS

In earlier versions of ASP.NET Core, partial views were applied using the `Html` property that is added to the C# class generated from the view, as explained in Chapter 21. The object returned by the `Html` property implements the `IHtmlHelper` interface, through which views can be applied, like this:

```
...
@Html.Partial("_RowPartial")
...
```

This type of expression works and is still supported, but the `partial` element provides a more elegant approach that is consistent with the rest of the HTML elements in the view.

Selecting the Partial View Model Using an Expression

The `for` attribute is used to set the partial view's model using an expression that is applied to the view's model, which is a feature more easily demonstrated than described. Add a partial view named `_CellPartial.cshtml` to the `Views/Home` folder with the content shown in Listing 22-28.

Listing 22-28. The Contents of the _CellPartial.cshtml File in the Views/Home Folder

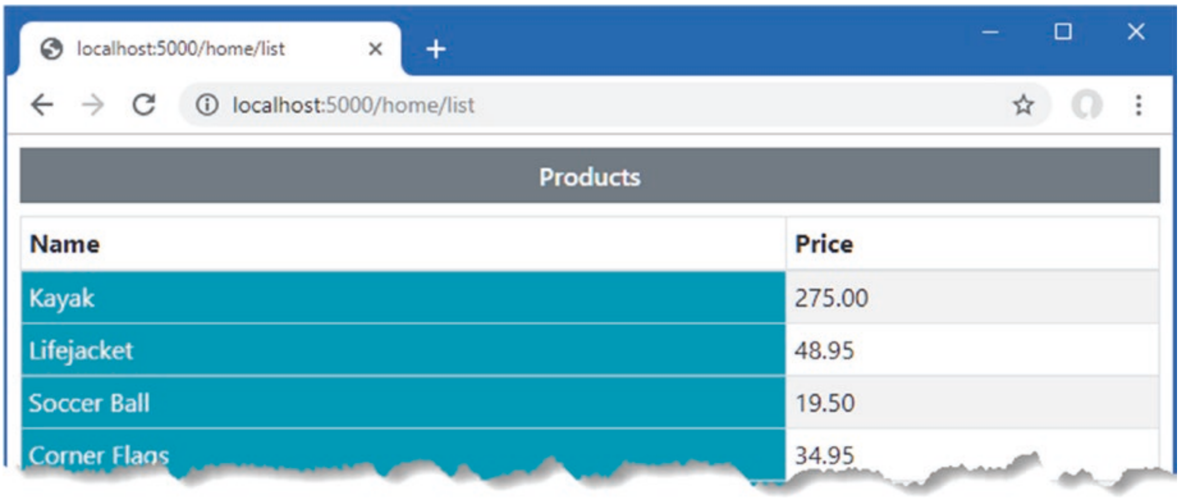
```
@model string

<td class="bg-info text-white">@Model</td>
```

This partial view has a string view model object, which it uses as the contents of a table cell element; the table cell element is styled using the Bootstrap CSS framework. In Listing 22-29, I have added a `partial` element to the `_RowPartial.cshtml` file that uses the `_CellPartial` partial view to display the table cell for the name of the `Product` object.

Listing 22-29. Using a Partial View in the _RowPartial.cshtml File in the Views/Home Folder

```
@model Product

<tr>
    <partial name="_CellPartial" for="Name" />
    <td>@Model.Price</td>
</tr>
```

The `for` attribute selects the `Name` property as the model for the `_CellPartial` partial view. To see the effect, use a browser to request `http://localhost:5000/home/list`, which will produce the response shown in Figure 22-15.



Products

Name	Price
Kayak	275.00
Lifejacket	48.95
Soccer Ball	19.50
Corner Flags	34.95

Figure 22-15. *Selecting a model property for use in a partial view*

USING TEMPLATED DELEGATES

Templated delegates are an alternative way of avoiding duplication in a view. Templated delegates are defined in a code block, like this:

```
...
@{
    Func<Product, object> row
        = @<tr><td>@item.Name</td><td>@item.Price</td></tr>;
}
...
```

The template is a function that accepts a `Product` input object and returns a dynamic result. Within the template expression, the input object is referred to as `item` in expressions. The templated delegate is invoked as a method expression to generate content.

```
...
<tbody>
    @foreach (Product p in Model) {
        @row(p)
    }
</tbody>
...
```

I find this feature awkward and prefer using partial views, although this is a matter of preference and habit rather than any objective problems with the way that templated delegates work.

Understanding Content-Encoding

Razor views provide two useful features for encoding content. The HTML content-encoding feature ensures that expression responses don't change the structure of the response sent to the browser, which is an important security feature. The JSON encoding feature encodes an object as JSON and inserts it into the response, which can be a useful debugging feature and can also be useful when providing data to JavaScript applications. Both encoding features are described in the following sections.

Understanding HTML Encoding

The Razor view engine encodes expression results to make them safe to include in an HTML document without changing its structure. This is an important feature when dealing with content that is provided by users, who may try to subvert the application or accidentally enter dangerous content. Listing 22-30 adds an action method to the Home controller that passes a fragment of HTML to the View method.

Listing 22-30. Adding an Action in the HomeController.cs File in the Controllers Folder

```
using Microsoft.AspNetCore.Mvc;
using System.Threading.Tasks;
using WebApp.Models;
using Microsoft.EntityFrameworkCore;

namespace WebApp.Controllers {

    public class HomeController: Controller {
        private DataContext context;

        public HomeController(DataContext ctx) {
            context = ctx;
        }

        public async Task<IActionResult> Index(long id = 1) {
            ViewBag.AveragePrice = await context.Products.AverageAsync(p => p.Price);
            return View(await context.Products.FindAsync(id));
        }

        public IActionResult List() {
            return View(context.Products);
        }

        public IActionResult Html() {
            return View((object)"This is a <h3><i>string</i></h3>");
        }
    }
}
```

The new action passes a string that contains HTML elements. To create the view for the new action method, add a Razor view file named `Html.cshtml` to the `Views/Home` folder with the content shown in Listing 22-31.

■ **Tip** Notice that I cast the string passed to the `View` method as an object, without which the string is assumed to be the name of a view and not the view model object.

Listing 22-31. The Contents of the Html.cshtml File in the Views/Home Folder

```
@model string
@{
    Layout = null;
}
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <div class="bg-secondary text-white text-center m-2 p-2">@Model</div>
</body>
</html>
```

Restart ASP.NET Core and use a browser to request `http://localhost:5000/home/html`. The response, which is shown on the left of Figure 22-17, shows how the potentially dangerous characters in the view model string have been escaped.

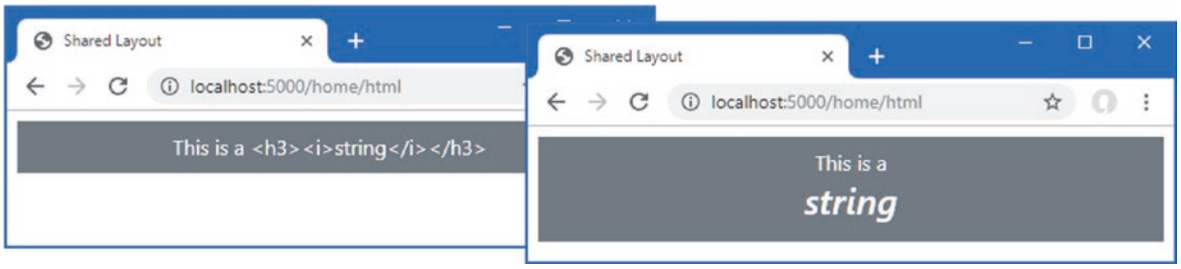
To include the result of an expression without safe encoding, you can invoke the `Html.Raw` method. The `Html` property is one of the properties added to the generated view class, described in Chapter 21, which returns an object that implements the `IHtmlHelper` interface, as shown in Listing 22-32.

Listing 22-32. Disabling Encoding in the Html.cshtml File in the Views/Home Folder

```
@model string
@{
    Layout = null;
}
<!DOCTYPE html>
<html>
<head>
    <link href="/lib/twitter-bootstrap/css/bootstrap.min.css" rel="stylesheet" />
</head>
<body>
    <div class="bg-secondary text-white text-center m-2 p-2">@Html.Raw(Model)</div>
</body>
</html>
```

Request the `http://localhost:5000/home/html` URL again, and you will see that the view model string is passed on without being encoded and is then interpreted by the browser as part of the HTML document, as shown on the right of Figure 22-16.

■ **Caution** Do not disable safe encoding unless you are entirely confident that no malicious content will be passed to the view. Careless use of this feature presents a security risk to your application and your users.



This is a <h3><i>string</i></h3>

This is a
string

Figure 22-16. *HTML result encoding*

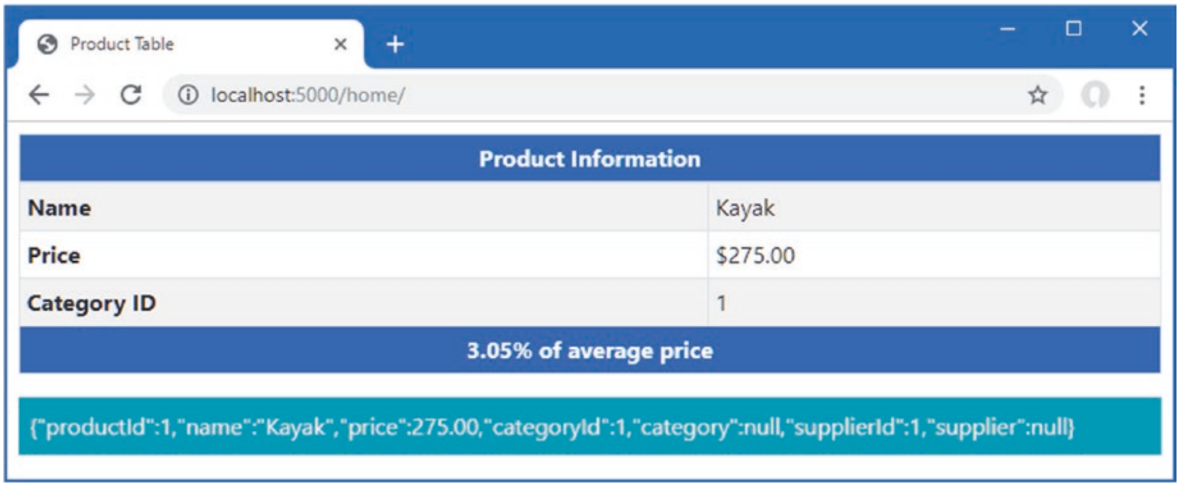
Understanding JSON Encoding

The `Json` property, which is added to the class generated from the view, as described in Chapter 21, can be used to encode an object as JSON. The most common use for JSON data is in RESTful web services, as described in earlier chapters, but I find the Razor JSON encoding feature useful as a debugging aid when I don't get the output I expect from a view. Listing 22-33 adds a JSON representation of the view model object to the output produced by the `Index` view.

Listing 22-33. Using JSON Encoding in the Index.cshtml File in the Views/Home Folder

```
@model Product
@{
    Layout = "_Layout";
    ViewBag.Title = ViewBag.Title ?? "Product Table";
}

@section Header {
    Product Information
}

<tr><th>Name</th><td>@Model.Name</td></tr>
<tr>
    <th>Price</th>
    <td>@Model.Price.ToString("c")</td>
</tr>
<tr><th>Category ID</th><td>@Model.CategoryId</td></tr>

@section Footer {
    @(((Model.Price / ViewBag.AveragePrice)
        * 100).ToString("F2"))% of average price
}

@section Summary {
    <div class="bg-info text-white m-2 p-2">
        @Json.Serialize(Model)
    </div>
}
```

The `Json` property returns an implementation of the `IJsonHelper` interface, whose `Serialize` method produces a JSON representation of an object. Use a browser to request `http://localhost:5000`, and you will see the response shown in Figure 22-17, which includes JSON in the `Summary` section of the view.



Product Information	
Name	Kayak
Price	$275.00
Category ID	1

3.05% of average price

```
{"productId":1,"name":"Kayak","price":275.00,"categoryId":1,"category":null,"supplierId":1,"supplier":null}
```

Figure 22-17. *Encoding an expression result as JSON*

Summary

In this chapter, I continued to describe the features available in Razor views. I showed you how to use the view bag, how to use layouts and partial views to deal with common content, and how to manage the encoding process for expression results. In the next chapter, I introduce Razor Pages, which provides an alternative way to generate HTML responses.