Sams Teach Yourself
jQuery and JavaScript
in 24 Hours
For D!

—A & F
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About the Author

Brad Dayley is a senior software engineer with more than 20 years of experience developing enterprise applications. He has used HTML/CSS, JavaScript, and jQuery extensively to develop a wide array of web pages, ranging from enterprise application interfaces to sophisticated, rich Internet applications, to smart interfaces for mobile web services. He is the author of *Python Phrasebook* and *jQuery and JavaScript Phrasebook*. 
I’d like to take this opportunity to thank all those who made this title possible. First, thanks to my wonderful wife and boys for giving me the inspiration and support I need. I’d never make it far without you.

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We Want to Hear from You!

As the reader of this book, you are our most important critic and commentator. We value your opinion and want to know what we’re doing right, what we could do better, what areas you’d like to see us publish in, and any other words of wisdom you’re willing to pass our way.

We welcome your comments. You can email or write to let us know what you did or didn’t like about this book—as well as what we can do to make our books better.

Please note that we cannot help you with technical problems related to the topic of this book.

When you write, please be sure to include this book’s title and author as well as your name and email address. We will carefully review your comments and share them with the author and editors who worked on the book.

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Visit our website and register this book at informit.com/register for convenient access to any updates, downloads, or errata that might be available for this book.
With billions of people using the Internet today, there is a rapidly growing trend to replace traditional websites, where pages link to other pages with a single page, with applications that have richly interactive elements. The main reason for this is that users have become less patient with clicking, waiting, and then having to navigate back and forth between web pages. Instead, they want websites to behave more like the applications they are used to on their computers and mobile devices.

In fact, in just the next 24 hours, millions of new web pages will be added to the Internet. The majority of these pages will be written in HTML, with CSS to style elements and with JavaScript to provide interaction between the user and back-end services.

As you complete the 24 one-hour lessons in this book, you will gain a practical understanding of how to incorporate JavaScript with the powerful jQuery library to provide rich user interactions in your web pages. You will gain the valuable skills of adding dynamic code that allows web pages to instantly react to mouse clicks and finger swipes, interact with back-end services to store and retrieve data from the web server, and create robust Internet applications.

Each hour in the book provides fundamentals that are necessary to create professional web applications. The book includes some basics on using HTML and CSS to get you started, even if you’ve never used them before. You are provided with code examples that you can implement and expand as your understanding increases. In fact, in just the first lesson in the book, you create a dynamic web page using jQuery and JavaScript.

So pull up a chair, sit back, and enjoy the ride of programming rich Internet applications with jQuery and JavaScript.

**Beyond jQuery and JavaScript**

This book covers more than jQuery and JavaScript because you need to know more than the language structure to create truly useful web applications. The goal of this book is to give you the fundamental skills needed to create fully functional and interactive web applications in just 24 short, easy lessons. This book covers the following key skills and technologies:
• HTML is the most current recommendation for web page creation. Every example in this book is validated HTML5, the most recent recommended version.

• CSS is the standard method for formatting web elements. You not only learn how to write CSS and CSS3, but also how to dynamically modify it on the fly using jQuery and JavaScript.

• JavaScript is the best method to provide interactions in web pages without the need to load a new page from the server. This is the standard language on which most decent web applications are built.

• jQuery, jQueryUI, and jQueryMobile are some of the most popular and robust libraries for JavaScript. jQuery provides very quick access to web page elements and a robust set of features for web application interaction. jQuery provides additional UI and mobile libraries that provide rich UI components for traditional web applications as well as mobile web applications.

• AJAX is the standard method that web applications use to interact with web servers and other services. The book includes several examples of using AJAX to interact with web servers, Google, Facebook, and other popular web services.

**Code Examples**

Most of the examples in the book provide the following elements:

• **HTML code**—Code necessary to provide the web page framework in the browser.

• **CSS code**—Code necessary to style the web page elements correctly.

• **JavaScript code**—This includes both the jQuery and JavaScript code that provide interactions among the user, web page elements, and web services.

• **Figures**—Most of the examples include one or more figures that illustrate the behavior of the code in the browser.

The examples in the book are basic to make it easier for you to learn and implement. Many of them can be expanded and used in your own web pages. In fact, some of the exercises at the end of each hour have you expand on the examples.

All the examples in the book have been tested for compatibility with the latest version of the major web browsers, including Google’s Chrome, Microsoft’s Internet Explorer, and Mozilla’s Firefox.
Special Elements

As you complete each lesson, margin notes help you immediately apply what you just learned to your own web pages.

Whenever a new term is used, it is clearly explained. No flipping back and forth to a glossary!

TIP
Tips and tricks to save you precious time are set aside in Tips so that you can spot them quickly.

NOTE
Notes highlight interesting information you should be sure not to miss.

CAUTION
When there’s something you need to watch out for, you’ll be warned about it in a Caution.

Q&A, Quizzes, and Exercises

Every hour ends with a short question-and-answer session that addresses the kind of “dumb questions” everyone wants to ask. A brief but complete quiz lets you test yourself to be sure you understand everything presented in the hour. Finally, one or two optional exercises give you a chance to practice your new skills before you move on.
What You’ll Learn in This Hour:
- Ways to add jQuery and JavaScript to your web pages
- Creating and manipulating arrays of objects
- Adding code logic to JavaScript
- Implementing JavaScript functions for cleaner code

Throughout the book, you’ll see several examples of using jQuery and JavaScript to perform various dynamic tasks. jQuery doesn’t replace JavaScript, it enhances it by providing an abstract layer to perform certain common tasks, such as finding elements or values, changing attributes and properties of elements, and interacting with browser events.

In this hour, you learn the basic structure and syntax of JavaScript and how to use jQuery to ease some of the development tasks. The purpose of this hour is to help you become familiar with the JavaScript language syntax, which is also the jQuery language syntax.

Adding jQuery and JavaScript to a Web Page
Browsers come with JavaScript support already built in to them. That means all you need to do is add your own JavaScript code to the web page to implement dynamic web pages. jQuery, on the other hand, is an additional library, and you will need to add the jQuery library to your web page before adding jQuery scripts.

Loading the jQuery Library
Because the jQuery library is a JavaScript script, you use the `<script>` tag to load the jQuery into your web page. jQuery can either be downloaded to your code directory and then hosted on your web server, or you can use the hosted versions that are available at jQuery.com. The following statement shows an example of each; the only difference is where jQuery is being loaded from:
<script src="http://code.jquery.com/jquery-latest.min.js"></script>
<script src="includes/js/jquery-latest.min.js"></script>

CAUTION

Remember that you need to place the <script> element to load the jQuery library before any script elements that are using it. Otherwise, those libraries will not be able to link up to the jQuery code.

The jQuery library downloads and hosted links can be found at the following location:
http://jquery.com/download/

**Implementing Your Own jQuery and JavaScript**

jQuery code is implemented as part of JavaScript scripts. To add jQuery and JavaScript to your web pages, first add a <script> tag that loads the jQuery library, and then add your own <script> tags with your custom code.

The JavaScript code can be added inside the <script> element, or the src attribute of the <script> element can point to the location of a separate JavaScript document. Either way, the JavaScript will be loaded in the same manner.

The following is an example of a pair of <script> statements that load jQuery and then use it. The document.write() function just writes text directly to the browser to be rendered:

```html
<script src="http://code.jquery.com/jquery-latest.min.js"></script>
<script>
    function writeIt(){
        document.write("jQuery Version "+$().jquery+" loaded.");
    }
</script>
```

NOTE

The <script> tags do not need to be added to the <head> section of the HTML document; they can also be added in the body. It’s useful to add simple scripts directly inline with the HTML elements that are consuming them.

**Accessing HTML Event Handlers**

So after you add your JavaScript to the web page, how do you get it to execute? The answer is that you tie it to the browser events. Each time a page or element is loaded, the user moves or clicks the mouse or types a character, an HTML event is triggered.
Each supported event is an attribute of the object that is receiving the event. If you set the attribute value to a JavaScript function, the browser will execute your function when the event is triggered.

For example, the following will execute the `writeIt()` function when the body of the HTML page is loaded:

```html
<body onload="writeIt()"
</body>
```

---

**TRY IT YOURSELF**

**Implementing JavaScript and jQuery**

Those are the basic steps. Now it is time to try it yourself. Use the following steps to add jQuery to your project and use it dynamically in a web page:

1. In Aptana, create a source folder named `hour05`.
2. In the same folder as the `hour05` folder, add an additional directory called `js`.
3. Go to jQuery.com/download and download the latest jQuery library to that folder and name the file `jquery.min.js`. The file may come up as clear text in the browser. If so, just press Ctrl+s (Command-s on Macs) and save the file that way.
4. Now create a source file named `hour0501.html` in the `hour05` folder.
5. Add the usual basic elements (html, head, body).
6. Inside the `<head>` element, add the following line to load the library you just downloaded:

   ```html
   <script src="../js/jquery.min.js"></script>
   ```

7. Now you can add your own `<script>` tag with the following code to print out the jQuery version to the browser windows:

   ```html
   <script>
   function writeIt(){
   document.write("jQuery Version "+$.jquery + " loaded.");
   }
   </script>
   ```

8. To have your script execute when the document is loaded, tie the `writeIt()` function to the `<body>` onload event using the following line:

   ```html
   <body onload="writeIt()"
   ```

9. Save the file, shown in Listing 5.1, and view it in a web browser. The output should be similar to Figure 5.1.
Accessing the DOM

One of the most important aspects of JavaScript, and especially jQuery, is the capability to access and manipulate the DOM. Accessing the DOM is how you make the web page dynamic by changing styles, size, position, and values of elements.

In the following sections, you learn about accessing the DOM through traditional methods via JavaScript and the much improved methods using jQuery selectors. These sections are a brief introduction. You will get plenty of practice as the hours roll on.
Using Traditional JavaScript to Access the DOM

Traditionally, JavaScript uses the global document object to access elements in the web page. The simplest method of accessing an element is to directly refer to it by id. For example, if you have a paragraph with the id="question" you can access it via the following JavaScript getElementById() function:

```javascript
var q = document.getElementById("question");
...
<p id="question">Which method do you prefer?</p>
```

Another helpful JavaScript function that you can use to access the DOM elements is getElementsByTagName(). This returns a JavaScript array of DOM elements that match the tag name. For example, to get a list of all the <p> elements, use the following function call:

```javascript
var paragraphs = document.getElementsByTagName("p");
```

Using jQuery Selectors to Access HTML Elements

Accessing HTML elements is one of jQuery's biggest strengths. jQuery uses selectors that are very similar to CSS selectors to access one or more elements in the DOM, hence, the name jQuery. jQuery returns back either a single element or an array of jQuerified objects. jQuerified means that additional jQuery functionality has been added to the DOM object, allowing for much easier manipulation.

The syntax for using jQuery selectors is $(selector).action(), where selector is replaced by a valid selector and action is replaced by a jQuerified action attached to the DOM element(s).

For example, the following command finds all paragraph elements in the HTML document and sets the CSS font-weight property to bold:

```javascript
$("p").css('font-weight', 'bold');
```

Using jQuery and JavaScript to Access DOM Elements

Now to solidify the concepts, you’ll run through a quick example of accessing and modifying DOM elements using both jQuery and JavaScript. Use the following steps to build the HTML document shown in Listing 5.2:

1. Create a source file named hour0502.html in the hour05 folder.
2. Add the usual basic elements (html, head, body).
3. Inside the `<head>` element, add the following line to load the library you just downloaded.

```html
<script src="../js/jquery.min.js"></script>
```

4. Add the following `<script>` element that accesses the DOM using both the JavaScript and jQuery methods. Notice that with jQuery two actions are chained together. The first sets the CSS `font-weight` property and the second changes text contained in element. With JavaScript, you use the `getElementById()` method, and then you set the `innerHTML` property directly in the DOM to change the text displayed in the browser.

```html
<script>
function writeIt(){
  $('#heading').css('font-weight', 'bold').html("jQuery");
  var q = document.getElementById("question");
  q.innerHTML = "I Prefer jQuery!";
}
</script>
```

5. To have your script execute when the document is loaded, tie the `writeIt()` function to the `<body> onload` event using the following line:

```html
<body onload="writeIt()"
```

6. Add the following `<p>` elements to the `<body>` to provide containers for the JavaScript code to access:

```html
<p id="heading">jQuery or JavaScript</p>
<p id="question">Which method do you prefer?</p>
```

7. Save the file and view it in a web browser. The output should be similar to Figure 5.2.

![Figure 5.2](image)

**FIGURE 5.2**
The function `writeIt()` is executed when the body loads and changes the content and appearance of the text.

**LISTING 5.2** Very Basic Example of Using JavaScript and jQuery to Access DOM Elements

```html
<!DOCTYPE html>
<html>
<head>
  <title>Hour 5-2</title>
</head>
<body onload="writeIt()">
<p id="heading">jQuery or JavaScript</p>
<p id="question">Which method do you prefer?</p>
<script>
function writeIt(){
  $('#heading').css('font-weight', 'bold').html("jQuery");
  var q = document.getElementById("question");
  q.innerHTML = "I Prefer jQuery!";
}
</script>
</body>
</html>
```
Understanding JavaScript Syntax

Like any other computer language, JavaScript is based on a rigid syntax where specific words mean different things to the browser as it interprets the script. This section is designed to walk you through the basics of creating variables, working with data types, and using looping and functions in JavaScript to manipulate your web pages.

Creating Variables

The first place to begin with in JavaScript is variables. Variables are a means to name data so that you can use that name to temporarily store and access data from your JavaScript files. Variables can point to simple data types, such as numbers or strings, or they can point to more complex data types, such as objects.

To define a variable in JavaScript, you must use the `var` keyword and then give the variable a name; for example:

```javascript
var myData;
```

You can also assign a value to the variable in the same line. For example, the following line of code creates a variable `myString` and assigns it the value of "Some Text":

```javascript
var myString = "Some Text";
```

This works as well as

```javascript
var myString;
myString = "Some Text";
```
After you have declared the variable, you can use the name to assign the variable a value and access the value of the variable. For example, the following code stores a string into the `myString` variable and then uses it when assigning the value to the `newString` variable:

```javascript
var myString = "Some Text";
var newString = myString + "Some More Text";
```

Your variable names should describe the data that is stored in them so that it is easy to use them later in your program. The only rule for creating variable names is that they must begin with a letter, $, or _, and they cannot contain spaces. Also remember that variable names are case sensitive, so using `myString` is different from `MyString`.

### Understanding JavaScript Data Types

JavaScript uses data types to determine how to handle data that is assigned to a variable. The variable type will determine what operations you can perform on the variable, such as looping or executing. The following list describes the most common types of variables that we will be working with through the book:

- **String**—Stores character data as a string. The character data is specified by either single or double quotes. All the data contained in the quotes will be assigned to the string variable. For example:
  ```javascript
  var myString = 'Some Text';
  var anotherString = "Some Other Text";
  ```

- **Number**—Stores the data as a numerical value. Numbers are useful in counting, calculations, and comparisons. Some examples are
  ```javascript
  var myInteger = 1;
  var cost = 1.33;
  ```

- **Boolean**—Stores a single bit that is either true or false. Booleans are often used for flags. For example, you might set a variable to false at the beginning of some code and then check it on completion to see whether the code execution hit a certain spot. The following shows an example of defining a true and a false variable:
  ```javascript
  var yes = true;
  var no = false;
  ```

- **Array**—An indexed array is a series of separate distinct data items all stored under a single variable name. Items in the array can be accessed by their zero-based index using the `[index]`. The following is an example of creating a simple array and then accessing the first element, which is at index 0:
  ```javascript
  var arr = ["one", "two", "three"]
  var first = arr[0];
  ```
Associative Array/Objects—JavaScript does support the concept of an associative array, meaning accessing the items in the array by a name instead of an index value. However, a better method is to use an object literal. When you use an object literal, you can access items in the object using `object.property` syntax. The following example shows how to create and access an object literal:

```javascript
var obj = {"name":"Brad", "occupation":"Hacker", "age": "Unknown"};
var name = obj.name;
```

Null—At times you do not have a value to store in a variable, either because it hasn’t been created or you are no longer using it. At this time you can set a variable to `null`. That way you can check the value of the variable in your code and use it only if it is not `null`.

```javascript
var newVar = null;
```

NOTE

JavaScript is a typeless language, meaning you do not need to tell the browser what data type the variable is; the interpreter will automatically figure out the correct data type for the variable.

### Using Operators

JavaScript operators provide the capability to alter the value of a variable. You are already familiar with the `=` operator because you used it several times in the book already. JavaScript provides several operators that can be grouped into two types—arithmetic and assignment.

### Arithmetic Operators

Arithmetic operators are used to perform operations between variable and direct values. Table 5.1 shows a list of the arithmetic operations along with the results that get applied.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>Example</th>
<th>Resulting x</th>
<th>Resulting y</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Addition</td>
<td><code>x=y+5</code></td>
<td>9&quot;49&quot;</td>
<td>444</td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>x=y+&quot;5&quot;</code></td>
<td>&quot;Four44&quot;</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>x=&quot;Four&quot;+y+&quot;4&quot;</code></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-</td>
<td>Subtraction</td>
<td><code>x=y-2</code></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>++</td>
<td>Increment</td>
<td><code>x=y++</code></td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td></td>
<td><code>x=++y</code></td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>
### Operator     Description     Example     Resulting x     Resulting y
---
- -  Decrement  x=y--  4  3
     x=--y  3  3
*  Multiplication  x=y*4  16  3
/  Division  x=10/y  2.5  4
%  Modulous  (remainder of Division)  x=y%3  1  4

**TIP**
The + operator can also be used to add strings or strings and numbers together. This allows you to quickly concatenate strings and add numerical data to output strings. Table 5.1 shows that when adding a numerical value and a string value, the numerical value is converted to a string, and then the two strings are concatenated.

### Assignment Operators
Assignment operators are used to assign a value to a variable. You are probably used to the = operator, but there are several forms that allow you to manipulate the data as you assign the value. Table 5.2 shows a list of the assignment operations along with the results that get applied.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Example</th>
<th>Equivalent Arithmetic Operators</th>
<th>Resulting x</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>x=5</td>
<td>x=5</td>
<td>5</td>
</tr>
<tr>
<td>+=</td>
<td>x+=5</td>
<td>x=x+5</td>
<td>15</td>
</tr>
<tr>
<td>-=</td>
<td>x-=5</td>
<td>x=x-5</td>
<td>5</td>
</tr>
<tr>
<td>*=</td>
<td>x*=5</td>
<td>x=x*5</td>
<td>25</td>
</tr>
<tr>
<td>/=</td>
<td>x/=5</td>
<td>x=x/5</td>
<td>2</td>
</tr>
<tr>
<td>%=</td>
<td>x%=5</td>
<td>x=x%5</td>
<td>0</td>
</tr>
</tbody>
</table>
Applying Comparison and Conditional Operators

Conditionals are a way to apply logic to your applications so that certain code will be executed only under the correct conditions. This is done by applying comparison logic to variable values. The following sections describe the comparisons available in JavaScript and how to apply them in conditional statements.

Comparison Operators

A comparison operator evaluates two pieces of data and returns true if the evaluation is correct or false if the evaluation is not correct. Comparison operators compare the value on the left of the operator against the value on the right.

The simplest way to help you understand comparisons is to provide a list with some examples. Table 5.3 shows a list of the comparison operators along with some examples.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Example</th>
<th>Example</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>==</td>
<td>Is equal to (value only) x==8</td>
<td>x==10</td>
<td>false</td>
</tr>
<tr>
<td>===</td>
<td>Both value and type are equal x===10</td>
<td>x===&quot;10&quot;</td>
<td>true</td>
</tr>
<tr>
<td>!=</td>
<td>Is not equal x!=5</td>
<td>x!=&quot;10&quot;</td>
<td>false</td>
</tr>
<tr>
<td>!==</td>
<td>Both value and type are not equal x!==10</td>
<td>x!=&quot;10&quot;</td>
<td>true</td>
</tr>
<tr>
<td>&gt;</td>
<td>Is greater than x&gt;5</td>
<td>x&gt;=10</td>
<td>true</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Is greater than or equal to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;</td>
<td>Is less than x&lt;5</td>
<td>x&lt;=10</td>
<td>false</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Is less than or equal to</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

You can chain multiple comparisons together using logical operators. Table 5.4 shows a list of the logical operators and how to use them to chain comparisons together.
### TABLE 5.4  JavaScript’s Comparison Operators as Well as Results Based on x=10 and y=5 to Begin With

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
<th>Example 1</th>
<th>Example 2</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>&amp;&amp;</td>
<td>and</td>
<td>(x==10 &amp;&amp; y==5)</td>
<td></td>
<td>true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(x==10 &amp;&amp; y&gt;x)</td>
<td></td>
<td>false</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>or</td>
<td>(x&gt;=10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(x&lt;10 &amp;&amp; y&gt;x)</td>
<td></td>
<td>false</td>
</tr>
<tr>
<td>!</td>
<td>not</td>
<td>!(x==y)</td>
<td></td>
<td>true</td>
</tr>
<tr>
<td></td>
<td></td>
<td>!(x&gt;y)</td>
<td></td>
<td>false</td>
</tr>
<tr>
<td>mix</td>
<td></td>
<td>(x&gt;=10 &amp;&amp; y&lt;x</td>
<td></td>
<td>x==y)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>((x&lt;y</td>
<td></td>
<td>x&gt;=10) &amp;&amp; y&gt;=5)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(! (x==y) &amp;&amp; y&gt;=10)</td>
<td></td>
<td>false</td>
</tr>
</tbody>
</table>

### If

An **if** statement enables you to separate code execution based on the evaluation of a comparison. The syntax is shown in the following lines of code where the conditional operators are in () parentheses and the code to execute if the conditional evaluates to true is in {} brackets:

```javascript
if(x==5){
  do_something();
}
```

In addition to executing code only within the **if** statement block, you can specify an **else** block that will get executed only if the condition is false. For example:

```javascript
if(x==5){
  do_something();
} else {
  do_something_else();
}
```

You can also chain **if** statements together. To do this, add a conditional statement along with an **else statement**. For example:

```javascript
if(x<5){
  do_something();
} else if(x<10) {
  do_something_else();
} else {
  do_nothing();
}
```
**switch**

Another type of conditional logic is the `switch` statement. The `switch` statement allows you to evaluate an expression once and then, based on the value, execute one of many sections of code.

The syntax for the `switch` statement is the following:

```javascript
switch(expression) {
    case value:
        code to execute
        break;
    case value2:
        code to execute
        break;
    default:
        code to execute if not value or value2.
}
```

This is what is happening. The `switch` statement will evaluate the expression entirely and get a value. The value may be a string, a number, a Boolean, or even an object. The `switch` value is then compared to each value specified by the `case` statement. If the value matches, the code in the `case` statement is executed. If no values match, the `default` code is executed.

**NOTE**

Typically, each `case` statement will include a break command at the end to signal a break out of the `switch` statement. If no break is found, code execution will continue with the next `case` statement.

---

**Applying if Conditional Logic in JavaScript**

To help you solidify using JavaScript conditional logic, use the following steps to build conditional logic into the JavaScript for a dynamic web page. The final version of the HTML document is shown in Listing 5.3:

1. Create a source file named hour0503.html in the hour05 folder.
2. Create a folder under hour05 named images.
3. Copy the day.png and night.png images from the website under code/hour05/images, or substitute your own into the images folder.
4. Add the usual basic elements (html, head, body).
5. Add the following `<script>` element that gets the hour value using the `Date().getHours()` JavaScript code. The code uses `if` statements to determine the time of day and does two things: It writes a greeting onto the screen and sets the value of the `timeOfDay` variable.

```javascript
function writeIt()
{
    var hour = new Date().getHours();
    var timeOfDay;
    if(hour>=7 && hour<12){
        document.write("Good Morning!");
        timeOfDay="morning";
    } else if(hour>=12 && hour<18) {
        document.write("Good Day!");
        timeOfDay="day";
    } else {
        document.write("Good Night!");
        timeOfDay="night";
    }
}
</script>
```

6. Now add the following `switch` statement that uses the value of `timeOfDay` to determine which image to display in the web page:

```javascript
switch(timeOfDay){
    case "morning":
        case "day":
            document.write("<img src='images/day.png' />")
            break;
    case "night":
        document.write("<img src='images/night.png' />")
        break;
    default:
        document.write("<img src='images/day.png' />")
        break;
}
```

7. Save the file and view it in a web browser. The output should be similar to Figure 5.3, depending on what time of day it is.

**FIGURE 5.3**
The function `writeIt()` is executed when the body loads and changes the greeting and image displayed on the web page.
Implementing Looping

Looping is a means to execute the same segment of code multiple times. This is extremely useful when you need to perform the same tasks on a set of DOM objects, or if you are dynamically creating a list of items.
JavaScript provides functionality to perform for and while loops. The following sections describe how to implement loops in your JavaScript.

**while Loops**
The most basic type of looping in JavaScript is the while loop. A while loop tests an expression and continues to execute the code contained in its {} brackets until the expression evaluates to false.

For example, the following while loop executes until the value of `i` is equal to 5:

```javascript
var i = 1;
while (i<5){
    document.write("Iteration "+i+"<br>");
    i++;
}
```

The resulting output to the browser is as follows:

- Iteration 1
- Iteration 2
- Iteration 3
- Iteration 4

**do/while Loops**
Another type of while loop is the do/while loop. This is useful if you always want to execute the code in the loop at least once and the expression cannot be tested until the code has executed at least once.

For example, the following do/while loop executes until the value of `day` is equal to Wednesday:

```javascript
var days = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday"]; var i=0;
do{
    var day=days[i++];
    document.write("It's " + day + "<br>");
} while (day != "Wednesday");
```

The resulting output to the browser is

- It's Monday
- It's Tuesday
- It's Wednesday
for Loops

The JavaScript for loop allows you to execute code a specific number of times by using a for statement that combines three statements into one using the following syntax:

```
for (statement 1; statement 2; statement 3;){
    code to be executed;
}
```

The for statement uses those three statements as follows when executing the loop:

- **statement 1**—Executed before the loop begins and not again. This is used to initialize variables that will be used in the loop as conditionals.
- **statement 2**—Expression that is evaluated before each iteration of the loop. If the expression evaluates to true, the loop is executed; otherwise, the for loop execution ends.
- **statement 3**—Executed each iteration after the code in the loop has executed. This is typically used to increment a counter that is used in statement 2.

To illustrate a for loop, check out the following example. The example not only illustrates a basic for loop, it also illustrates the capability to nest one loop inside another:

```javascript
for (var x=1; x<=3; x++){
    for (var y=1; y<=3; y++){
        document.write(x + " X " + y + " = " + (x*y) + "<br>");
    }
}
```

The resulting output to the web browser is as follows:

```
1 X 1 = 1
1 X 2 = 2
1 X 3 = 3
2 X 1 = 2
2 X 2 = 4
2 X 3 = 6
3 X 1 = 3
3 X 2 = 6
3 X 3 = 9
```

for/in Loops

Another type of for loop is the for/in loop. The for/in loop executes on any data type that can be iterated on. For the most part, you will use the for/in loop on arrays and objects. The following example illustrates the syntax and behavior of the for/in loop in a simple array:

```javascript
var days = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday"]; for (var idx in days){
```

document.write("It's " + days[idx] + "<br>");
}

Notice that the variable idx is adjusted each iteration through the loop from the beginning array index to the last. The resulting output is

It's Monday
It's Tuesday
It's Wednesday
It's Thursday
It's Friday

**Interrupting Loops**

When working with loops, at times you need to interrupt the execution of code inside the code itself without waiting for the next iteration. There are two ways to do this using the `break` and `continue` keywords.

The `break` keyword stops execution of the for or while loop completely. The `continue` keyword, on the other hand, stops execution of the code inside the loop and continues on with the next iteration. Consider the following examples:

Using a `break` if the day is Wednesday:

```javascript
var days = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday"];
for (var idx in days){
    if (days[idx] == "Wednesday")
        break;
    document.write("It's " + days[idx] + "<br>");
}
```

When the value is Wednesday, loop execution stops completely:

It's Monday
It's Tuesday

Using a `continue` if the day is Wednesday:

```javascript
var days = ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday"];
for (var idx in days){
    if (days[idx] == "Wednesday")
        continue;
    document.write("It's " + days[idx] + "<br>");
}
```

Notice that the `write` is not executed for Wednesday because of the `continue`; however, the loop execution did complete:

It's Monday
Creating Functions

One of the most important parts of JavaScript is making code that is reusable by other code. To do this, you combine your code into functions that perform specific tasks. A function is a series of code statements combined in a single block and given a name. The code in the block can then be executed by referencing that name.

Defining Functions

Functions are defined using the keyword `function` followed by a function name that describes the use of the function, list of zero or more arguments in `()` parentheses, and a block of one or more code statements in `{}` brackets. For example, the following is a function definition that writes “Hello World” to the browser.

```javascript
function myFunction(){
    document.write("Hello World");
}
```

To execute the code in `myFunction()`, all you need to do is add the following line to the main JavaScript or inside another function:

```javascript
myFunction();
```

Passing Variables to Functions

Frequently, you will need to pass specific values to functions that they will use when executing their code. Values are passed in comma-delimited form to the function. The function definition will need a list of variable names in the `()` parentheses that match the number being passed in. For example, the following function accepts two arguments, a `name` and `city`, and uses them to build the output string:

```javascript
function greeting(name, city){
    document.write("Hello " + name);
    document.write(". How is the weather in " + city);
}
```

To call the `greeting()` function, we need to pass in a `name` value and a `city` value. The value can be a direct value or a previously defined variable. To illustrate this, the following code will execute the `greeting()` function with a `name` variable and a direct string for the `city`:

```javascript
var name = "Brad";
greeting(name, "Florence");
```
Returning Values from Functions

Often, functions will need to return a value to the calling code. Adding a `return` keyword followed by a variable or value will return that value from the function. For example, the following code calls a function to format a string, assigns the value returned from the function to a variable, and then writes the value to the browser:

```javascript
function formatGreeting(name, city) {
    var retStr = "";
    retStr += "Hello <b>" + name + "</b><br>
    retStr += "Welcome to " + city + "!";
    return retStr;
}
var greeting = formatGreeting("Brad", "Rome");
document.write(greeting);
```

You can include more than one `return` statement in the function. When the function encounters a `return` statement, code execution of the function is stopped immediately. If the `return` statement contains a value to return, that value is returned. The following example shows a function that tests the input and returns immediately if it is zero:

```javascript
function myFunc(value) {
    if (value == 0)
        return;
    code_to_execute_if_value_nonzero;
}
```

### TRY IT YOURSELF

#### Creating JavaScript Functions

To help solidify functions, use the following steps to integrate some functions into a JavaScript application. The following steps take you through the process of creating a function, calling it to execute code, and then handling the results returned:

1. Create a source file named `hour0504.html` in the `hour05` folder.
2. Add the usual basic elements (`html`, `head`, `body`).
3. Add a `<script>` tag to the `<head>` element to house the JavaScript.
4. Insert the following object literal definition at the beginning of the script. The object will have planet names for attributes, and each planet name is a reference to an array of moons.

```javascript
var moonData = {
    "Earth": ["Luna"],
    "Jupiter": ["Io", "Europa"],
    "Saturn": ["Titan", "Rhea"],
    "Mars": ["Phobos", "Deimos"]
};
```
5. Add the following function that will be called by the `onload` event. In this function you use a nested `for/in` loop to iterate through the `moonData` object attributes. The outer loop gets the planet name and the inner loop loops through the index of the moon array.

```javascript
function writeIt(){
    for (planet in moonData){
        var moons = moonData[planet];
        for (moonIdx in moons){
            var moon = moons[moonIdx];
            var listItem = makeListItem(planet, moon);
            document.write(listItem);
        }
    }
}
```

6. Notice that on line 16 of the `writeIt()` function is a call to `makeListItem()`. That function needs to return a value that can be used in line 17 to write to the document. Add the following code to create the function. The function takes two arguments: a name and a value, then generates an HTML string to create a `<li>` element and returns the string.

```javascript
function makeListItem(name, value){
    var itemStr = "<li>" + name + "&nbsp;" + value + "</li>";
    return itemStr;
}
```

7. Save the file, shown in Listing 5.4, and open it in a web browser. You should see the results shown in Figure 5.4. You have just created two JavaScript functions: one that takes no arguments and does not return a value and the other that takes two arguments and returns a formatted HTML string containing the argument strings.

```
```

**FIGURE 5.4**
The function `writeIt()` is executed, which iterates through the `moonData` object and makes calls to the `makeListItem()` function to format the planet and moon names as an HTML `<li>` element.

**LISTING 5.4**  Simple Example of Using Conditional Logic Inside JavaScript

```html
01 <!DOCTYPE html>
02 <html>
```
After you start adding conditions, functions, and loops to your JavaScript applications, you need to understand variable scoping. Variable scope is simply this: “what is the value of a specific variable name at the current line of code being executed.”

JavaScript enables you to define both a global and a local version of the variable. The global version is defined in the main JavaScript, and local versions are defined inside functions. When you define a local version in a function, a new variable is created in memory. Within that function, you will be referencing the local version. Outside that function, you will be referencing the global version.

To understand variable scoping a bit better, consider the following code:

```html
03 <head>
04 <title>Hour 5-4</title>
05 <meta charset="utf-8" />  
06 <script>
07 var moonData = {
08   "Earth": ["Luna"],  
09     "Jupiter": ["Io", "Europa"],  
10     "Saturn": ["Titan", "Rhea"],  
11     "Mars": ["Phobos"]
12   }
13 function writeIt(){
14     for (planet in moonData){
15       var moons = moonData[planet];  
16       for (moonIdx in moons){
17         var moon = moons[moonIdx];  
18         var listItem = makeListItem(planet, moon);  
19         document.write(listItem);
20       }
21     }
22     function makeListItem(name, value){
23         var itemStr = "<li>" + name + ":&nbsp;" + value + "</li>";
24         return itemStr;
25     }
26   </script>
27 </head>
28 <body onload="writeIt()">
29   </body>
30 </html>
```

Understanding Variable Scope

After you start adding conditions, functions, and loops to your JavaScript applications, you need to understand variable scoping. Variable scope is simply this: “what is the value of a specific variable name at the current line of code being executed.”

JavaScript enables you to define both a global and a local version of the variable. The global version is defined in the main JavaScript, and local versions are defined inside functions. When you define a local version in a function, a new variable is created in memory. Within that function, you will be referencing the local version. Outside that function, you will be referencing the global version.

To understand variable scoping a bit better, consider the following code:

```javascript
01 <script>
02   var myVar = 1;
03   function writeIt(){
```
The global variable `myVar` is defined on line 2. Then on line 4, a local version is defined within the `writeIt()` function. So, line 5 will write 2 to the document. Then in line 6, `writeMore()` is called. Because there is no local version of `myVar` defined in `writeMore()`, the value of the global `myVar` is written in line 9.

### Adding Error Handling

An important part of JavaScript coding is adding error handling for instances where there may be problems. By default, if a code exception occurs because of a problem in your JavaScript, the script fails and does not finish loading. This is not usually the desired behavior.

#### Try/Catch Blocks

To prevent your code from totally bombing out, use `try/catch` blocks that can handle problems inside your code. If JavaScript encounters an error when executing code in a `try/catch` block, it will jump down and execute the `catch` portion instead of stopping the entire script. If no error occurs, all of the `try` will be executed and none of the `catch`.

For example, the following `try/catch` block will execute any code that replaces `your_code_here`. If an error occurs executing that code, the error message followed by the string "\: happened when loading the script" will be written to the document:

```javascript
try {
    your_code_here
} catch (err) {
    document.write(err.message + "\: happened when loading the script");
}
```

#### Throw Your Own Errors

You can also throw your own errors using a `throw` statement. The following code illustrates how to add throws to a function to `throw` an error, even if a script error does not occur:

```javascript
try {
    if (x == "") throw "Can't Square Root Nothing";
    if (isNaN(x)) throw "Can't Square Root Strings";
}
```
if (x<0) throw "Sorry No Imagination";
return "sqrt(\"x\") = \" + Math.sqrt(x) + \"\n\"; 
} catch(err){
  return err;
}

function writeIt(){
document.write(sqrRoot("four") + \"<br>\");
document.write(sqrRoot(\"") + \"<br>\") ;
document.write(sqrRoot("4") + \"<br>\") ;
document.write(sqrRoot("-4") + \"<br>\") ;
}
</script>

The function `sqrRoot()` accepts a single argument `x`. It then tests `x` to verify that it is a positive number and returns a string with the square root of `x`. If `x` is not a positive number, the appropriate error is thrown and returned to `writeIt()`.

**Using finally**

Another valuable tool in exception handling is the `finally` keyword. A `finally` keyword can be added to the end of a `try/catch` block. After the `try/catch` blocks are executed, the `finally` block is always executed. It doesn’t matter if an error occurs and is caught or if the `try` block is fully executed.

Following is an example of using a `finally` block inside a web page:

```javascript
function testTryCatch(value){
  try {
    if (value < 0){
      throw "too small";
    } else if (value > 10){
      throw "too big";
    }
    your_code_here
  } catch (err) {
    document.write("The number was "+ err.message);
  } finally {
    document.write("This is always written.");
  }
}
```
Summary

In this hour, you learned the basics of adding jQuery and JavaScript to web pages. The basic data types that are used in JavaScript and, consequently, jQuery, were described. You learned some of the basic syntax of applying conditional logic to JavaScript applications. You also learned how to compartmentalize your JavaScript applications into functions that can be reused in other locations. Finally, you learned some ways to handle JavaScript errors in your script before the browser receives an exception.

Q&A

Q. When should you use a regular expression in string operations?
A. That depends on your understanding of regular expressions. Those who use regular expressions frequently and understand the syntax well would almost always rather use a regular expression because they are so versatile. If you are not very familiar with regular expressions, it takes time to figure out the syntax, and so you will want to use them only when you need to. The bottom line is that if you need to manipulate strings frequently, it is absolutely worth it to learn regular expressions.

Q. Can I load more than one version of jQuery at a time?
A. Sure, but there really isn’t a valid reason to do that. The one that gets loaded last will overwrite the functionality of the previous one. Any functions from the first one that were not overwritten may be completely unpredictable because of the mismatch in libraries. The best bet is to develop and test against a specific version and update to a newer version only when there is added functionality that you want to add to your web page.

Workshop

The workshop consists of a set of questions and answers designed to solidify your understanding of the material covered in this hour. Try to answer the questions before looking at the answers.

Quiz

1. What is the difference between == and === in JavaScript?
2. What is the difference between the break and continue keywords?
3. When should you use a finally block?
4. What is the resulting value when you add a string “1” to a number 1, (“1”+1)?
Quiz Answers

1. `==` compares only the relative value; `===` compares the value and the type.

2. `break` will stop executing the loop entirely, whereas `continue` will only stop executing the current iteration and then move on to the next.

3. When you have code that needs to be executed even if a problem occurs in the `try` block.

4. The string “11” because the number is converted to a string and then concatenated.

Exercises

1. Open hour0504.html and modify it to create a table instead of a list. You will need to add code to the `writeIt()` function that writes the `<table>` open tag before iterating through the planets and then the closing tag after iterating through the planets. Then modify the `makeListItem()` function to return a string in the form of `<tr><td>planet</td><td>moon</td></tr>`

2. Modify hour0503.html to include some additional times with different messages and images. For example, between 8 and 9 you could add the message “go to work” with a car icon, between 5 and 6 you could add the message “time to go home” with a home icon. You will need to add some additional cases to the `switch` statement and set the `timeOfDay` value accordingly.
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