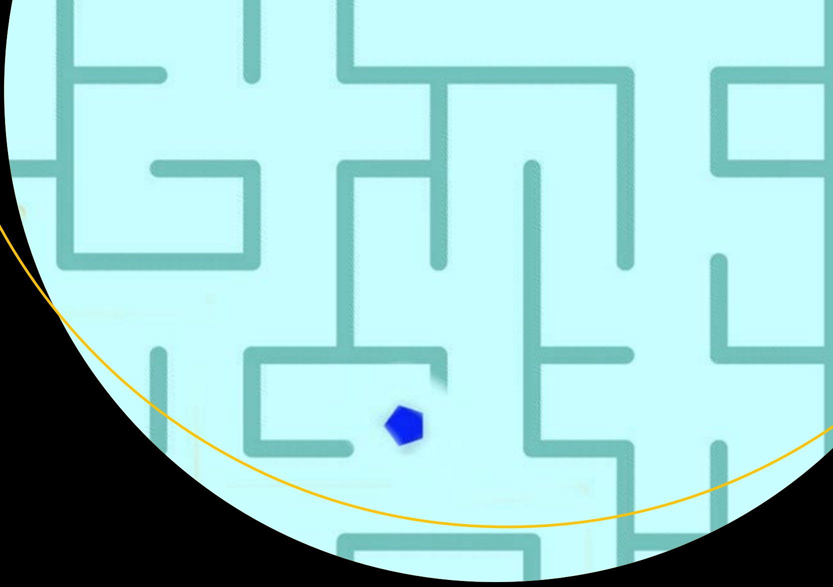

The Essential Guide to HTML5

Using Games to Learn HTML5 and JavaScript

—

Second Edition

—

Jeanine Meyer

Apress®

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Jeanine Meyer
Purchase, NY, USA

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To Annika, Daniel, Aviva, and Anne,
and to Esther and Joseph, who are still in our lives

Table of Contents

About the Author

Jeanine Meyer is slowly moving into retirement from Purchase College/State University of New York, where she now is officially Professor Emirata. She taught and still teaches courses for mathematics/computer science along with general education mathematics courses, the latest being one on origami. The website for her academic activities is `http://faculty.purchase.edu/jeanine.meyer` and materials are available at `http://moodle.purchase.edu`. Before coming to academia, she was a Research Staff Member and Manager at IBM Research, working on robotics and manufacturing research and later as a consultant for IBM's educational grant programs. Her first academic job was at Pace University.

For Jeanine, programming is both a hobby and a vocation. Every day, she plays computer puzzles online (including Words with Friends, various solitaire card games, and Duolingo for Spanish, which she views as a game). She tries *The New York Times* crossword puzzle most days, but does better at the mini-puzzle, in which she competes with her children. She also does ken ken. She enjoys cooking, baking, eating, gardening, travel, and a moderate amount of walking. She misses her mother, who inspired both Jeanine and Aviva, her daughter, to take up piano and her father, who gave her a love of puzzles. She is an active volunteer for progressive causes and candidates.

About the Technical Reviewer

Takashi Mukoda is an international student at Purchase College/State University of New York. Now, he is taking a semester off and back home in Japan. At Purchase College, he majors in Mathematics/Computer Science and New Media and has worked as a teaching assistant for computing and mathematics courses.

Takashi likes playing the keyboard and going on hikes in the mountains to take pictures. His interest in programming and art incites him to create multimedia art pieces. Some of them are built with Processing and interact with human motion and sounds.
(check out his website at `http://www.takashimukoda.com`)

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Thanks to the crew at Apress and Springer for all their efforts.

Introduction

There was considerable enthusiasm about the new capabilities of HTML5, and even suggestions that no other technologies or products are necessary to produce dynamic, engrossing, interactive websites. That may be overstating things, but it is true the new features are exciting. HTML is HTML5. It now is possible, using just HTML, Cascading Style Sheets, and JavaScript, to draw lines, arcs, circles, and ovals on the screen and specify events and event handling to produce animation and respond to user actions. You can include video and audio on your website with standard controls, or include the video or audio in your application exactly when and where needed. You can create forms that validate the input and provide immediate feedback to users. You can use a facility similar to cookies to store information on the client computer. And you can use new elements, such as headers and footers, to help structure your documents.

This book is based on my teaching practices and past writings. Delving into the features of a technology or general programming concepts is best done when there is a need and a context. Games, especially familiar and simple ones, supply the context and thus the motivation and much of the explanation. When learning a new programming language, one of my first steps is to program the game of craps. Also, if I can build a ballistics simulation with animation, such as the slingshot game, and make a video or audio clip play when a specific condition occurs, I am happy. If I can construct my own maze of walls, draw a stick figure for hangman, and store information on the player's computer, I am ecstatic. And that’s what we do in this book. As you see how to build these simple games, you’ll build your expertise as well.

This goal of this book, developed with considerable help from the Apress staff and the technical reviewer, Takashi Mukoda, is to introduce you to programming, with the motivation of implementing games and building websites to share with others.

- At the time of updating this book, browser support for HTML5 features is close to complete. The applications have been tested using Chrome, Firefox, and Safari. However, it is important to keep in mind that browsers can change.

- My focus is on plain HTML and JavaScript because it has been my experience that knowledge and experience with the basics is the best introduction. Frameworks and libraries exist and continue to be developed and refined and at some point; these are appropriate to study. The reader can turn to these topics after getting comfortable with the basics. I note that my *HTML5 and JavaScript Projects* book has been updated and follows this text in complexity.

Who Is This Book For?

This book is for people who want to learn how HTML, JavaScript, and Cascading Style Sheets can serve to build dynamic, exciting websites. It's for you if you know something about programming and want to see what the current version of HTML and JavaScript bring to the table. And it's also for you if you have no programming experience whatsoever. Perhaps you're a web designer or website owner and you want to know how to make things happen behind the scenes or how to request features from programmers.

With this book, we want to showcase the new(er) features of HTML5 and demystify the art of programming. Programming is an art and creating appealing games and other applications requires talent and attention to the audience. However, if you can put together words to form sentences and sentences to form paragraphs, and you have some sense of logic, you can program.

How Is This Book Structured?

The book consists of 10 chapters, each organized around a familiar game or similar application. There is considerable redundancy in the chapters so you can skip around if you like, though the games do get more complex. Each chapter starts by listing the technical features that will be covered and describing the application. We look first at the critical requirements in a general sense: what do we need to implement the application, independent of any specific technology. We then focus on the features of HTML5, CSS, JavaScript, or general programming methodology that satisfy the requirements. Finally, we examine the implementation of the application in detail. I break out the code line by line in a table, with comments next to each line. In the cases where multiple versions of a game are described, only the new lines of code are annotated. This isn't to deprive you of information, but to encourage you to see what is similar, what is different, and to demonstrate how you can build applications in stages. It certainly is appropriate to consult the commented programs on an as-needed basis. Each chapter includes suggestions on how to make the application your own, and how to test and upload the application to a website. The summary at the end of each chapter highlights what you've learned and what you'll find ahead.

Conventions Used in This Book

The applications in this book are HTML documents. The JavaScript is in a script element in the head element and the CSS is in the style element in the head element. The body element contains the static HTML, including any canvas elements. Several examples depend on external image files and one example requires external video files and audio files and another external audio files.

Layout Conventions

To keep this book as clear and easy to follow as possible, the following text conventions are used throughout:

- Code is presented in `fixed-width font`.
- The complete code for each application is presented in table, with the left column holding each statement and the right column holding an explanatory comment.
- Pseudo-code is written in *`italic fixed-width font`*.
- Sometimes code won't fit on a single line in a book. Where this happens, I use an arrow like this: ➥.

So, with the formalities out of the way, let's get started.

CHAPTER 1

The Basics

In this chapter, we cover

- The basic structure of an HTML document
- The `html`, `head`, `title`, `script`, `style`, `body`, `img`, and a elements
- A Cascading Style Sheet (CSS) example
- A JavaScript code example, using `Date` and `document.write`

Introduction

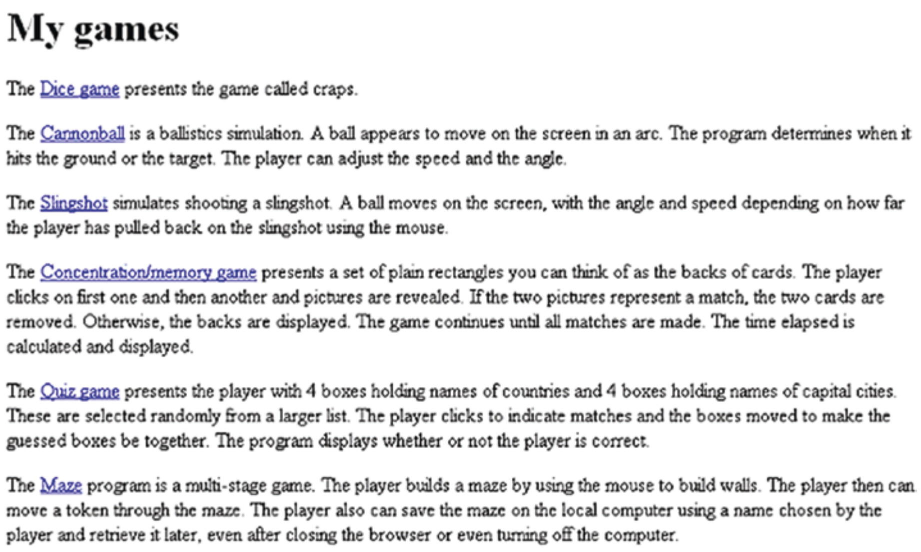
Hypertext Markup Language (HTML) is the language for delivering content on the Web. HTML is not owned by anyone, but is the result of people working in many countries and many organizations to define the features of the language. An HTML document is a text document that you can produce using any text editor. HTML documents contain elements surrounded by tags—text that starts with a `<` symbol and ends with a `>` symbol. An example of a tag is `<img src="home.gif"/>`. This particular tag will display the image held in the file `home.gif`. These tags are the *markup*. It is through the use of tags that hyperlinks, images, and other media are included in web pages.

Basic HTML can include directives for formatting in a language called Cascading Style Sheets (CSS) and programs for interaction in a language called JavaScript. Browsers, such as Firefox and Chrome, interpret the HTML along with any CSS and JavaScript to produce what we experience when we visit a website. HTML holds the content of the website, with tags providing information on the nature and structure of the content as well as references to images and other media. CSS specifies the formatting. The same content can be formatted in different ways. JavaScript is a programming language that's used to make the website dynamic and interactive. In all but the smallest working groups, different people may be responsible for the HTML, CSS, and JavaScript, but it's always a good idea to have a basic understanding of how these different tools work together. If you are already familiar with the basics of HTML and how CSS and JavaScript can be added together, you may want to skip ahead to the next chapter. Still, it may be worth casting your eye over the content in this chapter, to make sure you are up to speed on everything before we start on the first core examples.

The latest version of HTML (and its associated CSS and JavaScript) is HTML5. It has generated considerable excitement because of features such as the canvas for displaying pictures and animation; support for video and audio; and tags for defining common document elements such as `header`, `section`, and `footer`. You can create a sophisticated, highly interactive website with HTML5. As of this writing, not all browsers accept all the features, but you can get started learning HTML5, CSS, and JavaScript now. Learning JavaScript will introduce you to general programming concepts that will be beneficial if you try to learn any other programming language or if you work with programmers as part of a team.

The approach I'll use in this book is to explain HTML5, CSS, and JavaScript concepts in the context of specific examples, most of which will be familiar games. Along the way, I'll use small examples to demonstrate specific features. Hopefully, this will help you both understand what you want to do and appreciate how to do it. You will know where we are headed as I explain the concepts and details.

The task for this chapter is to build a web page of links to other websites. In this way, you'll get a basic understanding of the structure of an HTML document, with a small amount of CSS code and JavaScript code. For this and other examples, please think of how to make the project meaningful to you. The page could be a list of your own projects, favorite sites, or sites on a particular topic. For each site, you'll see text and a hyperlink. The second example includes some extra formatting in the form of boxes around the text, pictures, and the day's date and time. Figure 1-1 and Figure 1-2 show the different examples I've created.



My games

The Dice game presents the game called craps.

The Cannonball is a ballistics simulation. A ball appears to move on the screen in an arc. The program determines when it hits the ground or the target. The player can adjust the speed and the angle.

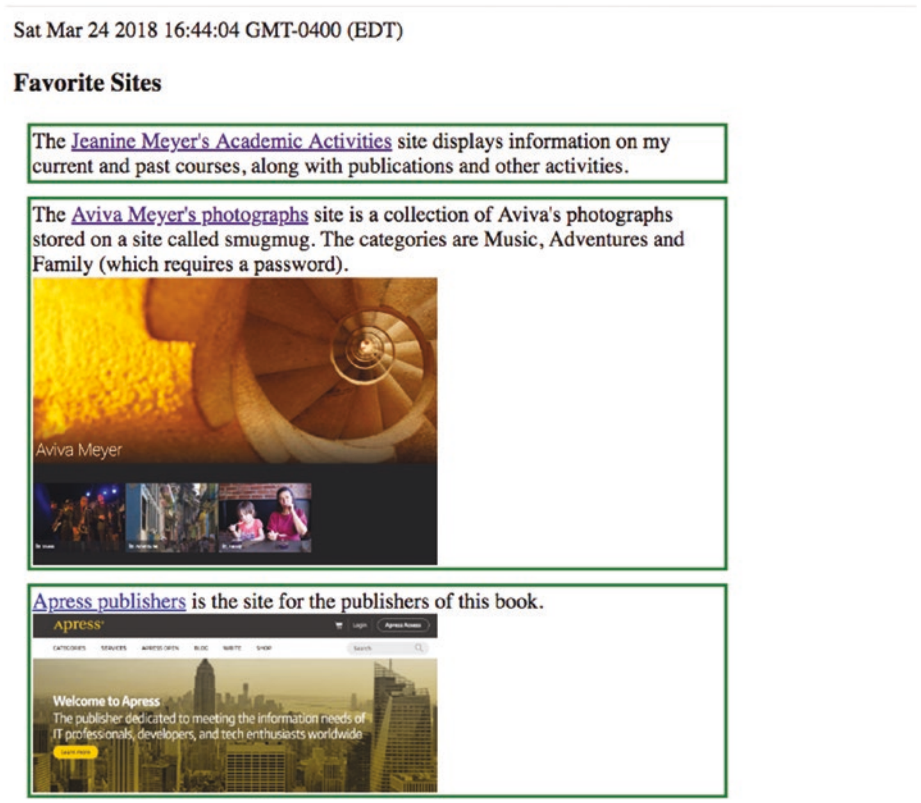
The Slingshot simulates shooting a slingshot. A ball moves on the screen, with the angle and speed depending on how far the player has pulled back on the slingshot using the mouse.

The Concentration/memory game presents a set of plain rectangles you can think of as the backs of cards. The player clicks on first one and then another and pictures are revealed. If the two pictures represent a match, the two cards are removed. Otherwise, the backs are displayed. The game continues until all matches are made. The time elapsed is calculated and displayed.

The Quiz game presents the player with 4 boxes holding names of countries and 4 boxes holding names of capital cities. These are selected randomly from a larger list. The player clicks to indicate matches and the boxes moved to make the guessed boxes be together. The program displays whether or not the player is correct.

The Maze program is a multi-stage game. The player builds a maze by using the mouse to build walls. The player then can move a token through the maze. The player also can save the maze on the local computer using a name chosen by the player and retrieve it later, even after closing the browser or even turning off the computer.

Figure 1-1. *An annotated list of games*



Sat Mar 24 2018 16:44:04 GMT-0400 (EDT)

Favorite Sites

The Jeanine Meyer's Academic Activities site displays information on my current and past courses, along with publications and other activities.

The Aviva Meyer's photographs site is a collection of Aviva's photographs stored on a site called smugmug. The categories are Music, Adventures and Family (which requires a password).

Apress publishers is the site for the publishers of this book.

apress
Welcome to Apress
The publisher dedicated to meeting the information needs of IT professionals, developers, and tech enthusiasts worldwide

Figure 1-2. *Favorite sites, with extra formatting*

When you reload the Favorite Sites page, the date and time will change to the current date and time according to your computer.

Critical Requirements

The requirements for the list of links application are the very fundamental requirements for building a web page containing text, links, and images. For the example shown in Figure 1-1, each entry appears as a paragraph. In the example shown in Figure 1-2, in contrast, each entry has a box around it. The second example also includes images and a way to obtain the current day, date, and time. Later applications will require more discussion, but for this one we'll go straight to how to implement it using HTML, CSS, and JavaScript.

HTML5, CSS, and JavaScript Features

As I noted, HTML documents are text, so how do we specify links, pictures, formatting, and coding? The answer is in the markup, that is, the tags. Along with the HTML that defines the content, you'll typically find CSS styles, which can be specified either inside the HTML document or in an external document. You might also include JavaScript for interactivity, again specified in the HTML document or in an external document. We'll start with a look at how you can build simple HTML tags, and how you can add inline CSS and JavaScript all within the same document.

Basic HTML Structure and Tags

An HTML element begins with a starting tag, which is followed by the element content and an ending tag. The ending tag includes a / symbol followed by the element type, for example /head. Elements can be nested within elements. A standard HTML document looks like this:

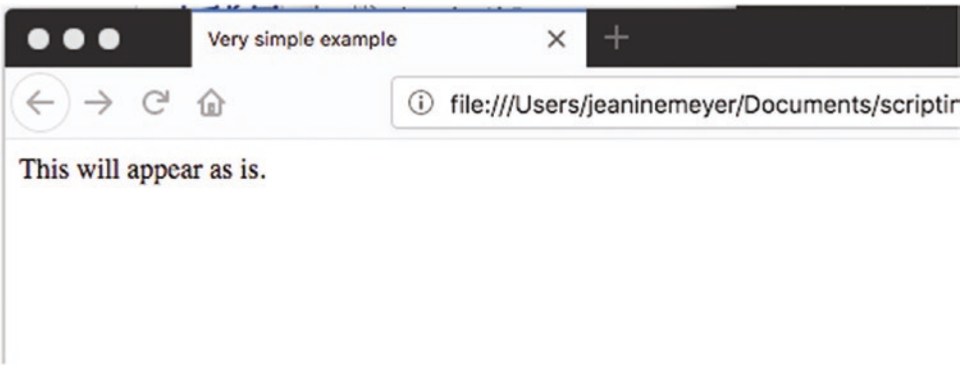
```
<html>
   <head>
      <title>Very simple example
      </title>
   </head>
```

```
    <body>
       This will appear as is.
    </body>
</html>
```

Note that I've indented the nested tags here to make them more obvious, but HTML itself ignores this indentation (or whitespace, as it's known), and you don't need to add it to your own files. In fact, for most of the examples throughout this book, I don't indent my code.

This document consists of the `html` element, indicated by the starting tag `<html>` and ending with the closing tag: `</html>`.

HTML documents typically have a `head` and a `body` element, as this one has. This `head` element contains one element, `title`. The HTML title shows up different places in different browsers. Figure 1-3 shows the title, "Very Simple Example", on a tab in Firefox.



This will appear as is.

Figure 1-3. *The HTML title on a tab in Firefox browser*

In most cases, you will create something within the body of the web page that you'll think of as a title, but it won't be the HTML title! Figure 1-3 also shows the body of the web page: the short piece of text. Notice that the words html, head, title, and body do not appear. The tags "told" the browser how to display the HTML document.

We can do much more with text, but let's go on to see how to get images to appear. This requires an `img` element. Unlike the `html`, `head`, and `body` elements that use starting and ending tags, the `img` element just uses one tag. It is called a singleton tag. Its element type is `img` (not image) and you put all the information with the tag itself using what are termed attributes. What information? The most important item is the name of the file that holds the image. The tag

```
<img src="frog.jpg"/>
```

tells the browser to look for a file with the name frog and the file type .jpg. In this case, the browser looks in the same directory or folder as the HTML file. You can also refer to image files in other places and I'll show this later. The `src` stands for source. It is termed an attribute of the element. The slash before the > indicates that this is a singleton tag. There are common attributes for different element types, but most element types have additional attributes. Another attribute for `img` elements is the `width` attribute.

```
<img src="frog.jpg" width="200"/>
```

This specifies that the image should be displayed with a width of 200 pixels. The height will be whatever is necessary to keep the image at its original aspect ratio. If you want specific widths and heights, even if that may distort the image, specify both `width` and `height` attributes.

Tip You'll see examples (maybe even some of mine) in which the closing slash is missing that work just fine. It is considered good practice to include it. Similarly, you'll see examples in which there are no quotation marks around the name of the file. HTML is more forgiving in terms of syntax (punctuation) than most other programming systems. Finally, you'll see HTML documents that start with a tag of type`!DOCTYPE` and have the HTML tag include other information. At this point, we don't need this so I will keep things as simple as I can (but no simpler, to quote Einstein).

Producing hyperlinks is similar to producing images. The type of element for a hyperlink is `a` and the important attribute is `href`.

```
<a href="http://faculty.purchase.edu/jeanine.meyer">Jeanine Meyer's
Academic Activities </a>
```

As you can see, this element has a starting and ending tag. The content of the element, whatever is between the two tags—in this case, Jeanine Meyer's Academic Activities—is what shows up in blue and underlined. The starting tag begins with `a`. One way to remember this is to think of it as the most important element in HTML, so it uses the first letter of the alphabet. You can also think of an anchor, which is what the a actually stands for, but that isn't as meaningful for me. The href attribute (think hypertext reference) specifies the website where the browser goes when the hyperlink is clicked. Notice that this is a full web address (called a Universal Resource Locator, or URL, for short).

Web addresses can be absolute or relative. An absolute address starts with `http://`. A relative address is relative to the location of the HTML file. Using relative addressing makes it easier to move your project to a different website and you can indicate the folder one level up by using `../`. In my example, the `frog.gif` file, `frogface.gif` file, and other image files are located in the same folder as my HTML file. They are there because I put them there! For large projects, many people put all the images in a subfolder called images and write addresses as `images/postcard.gif`. File management is a big part of creating web pages.

We can combine a hyperlink element with an `img` element to produce a picture on the screen that a user can click on. Remember that elements can be nested within other elements. Instead of putting text after the starting `<a>` tag, put an `<img>` tag:

```
<a href="http://faculty.purchase.edu/jeanine.meyer">
<img src="jhome.gif" width="100" />
</a>
```

Let's put these examples together now:

```
<html>
<head>
<title>Second example </title>
</head>
<body>
This will appear as is.
<img src="frog.gif"/>
<img src="frog.gif" width="200"/>
<a href=http://faculty.purchase.edu/jeanine.meyer>Jeanine Meyer's Academic
 Activities </a>
<a href=http://faculty.purchase.edu/jeanine.meyer><img src="jhome.gif"/></
a>
</body>
</html>
```

I created the HTML file, saved it as `second.html`, and then opened it in the Chrome browser. Figure 1-4 shows what is displayed.

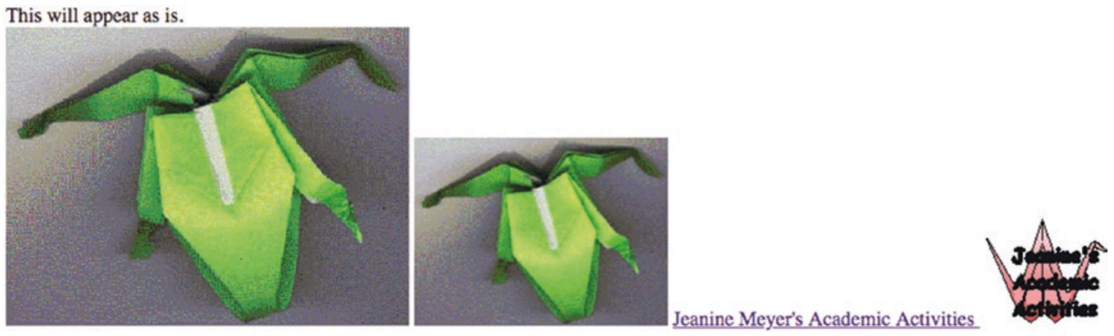

This will appear as is.
Jeanine Meyer's Academic Activities
Jeanine's Academic Activities

Figure 1-4. *Example with images and hyperlinks*

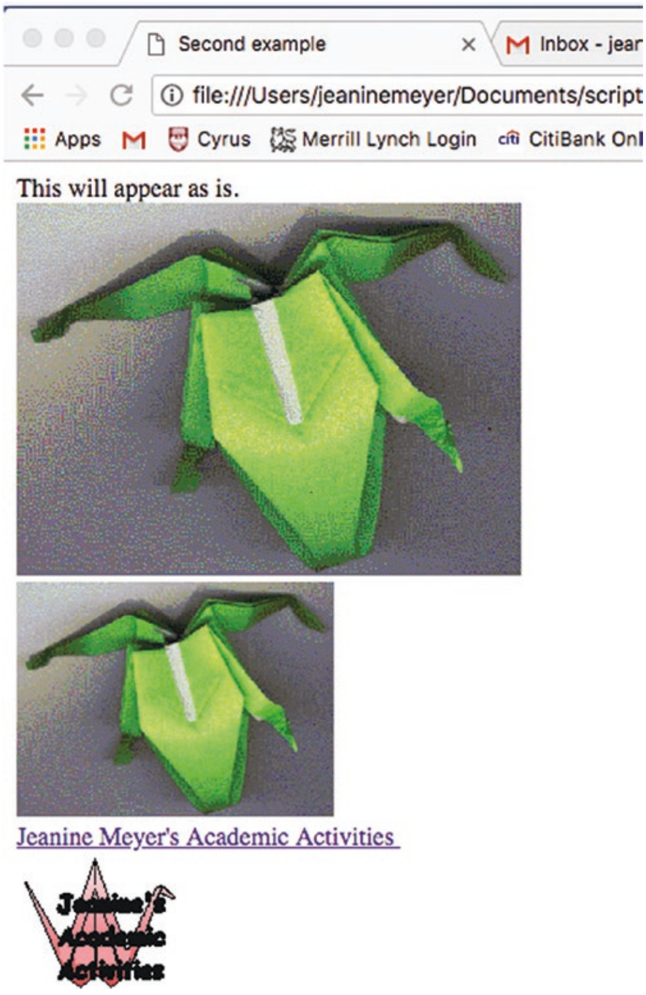
This produces the text; the image in its original width and height; the image with the width fixed at 200 pixels and height proportional; a hyperlink that will take you to my web page (I promise); and another link that uses an image that will also take you to my web page. However, this isn't quite what I had in mind. I wanted these elements spaced down the page.

This demonstrates something you need to remember: HTML ignores line breaks and other whitespace. If you want a line break, you have to specify it. One way is to use the `br` singleton tag. I'll show other ways later. Take a look at the following modified code. Notice that the `<br/>` tags don't need to be on a line by themselves.

```
<html>
<head>
<title>Second example </title>
</head>
<body>
This will appear as is. <br/>
<img src="frog.gif"/>
<br/>
<img src="frog.gif" width="200"/>
<br/>
<a href=http://faculty.purchase.edu/jeanine.meyer>Jeanine Meyer's Academic
 Activities </a>
<br/>
```

```
<a href=http://faculty.purchase.edu/jeanine.meyer><img src="jhome.gif"/></
a>
</body>
</html>
```

Figure 1-5 shows what this code produces.


Second example
Inbox - jear
file:///Users/jeaninemeyer/Documents/script
Apps
Cyrus
Merrill Lynch Login
CitiBank Onl

This will appear as is.

Jeanine Meyer's Academic Activities

Jeanine's Academic Activities

Figure 1-5. *Text, images, and links with line breaks*

There are many HTML element types: the h1 through h6 heading elements produce text of different sizes; there are various elements for lists and tables, and others for forms. CSS, as we'll see in a moment, is also used for formatting. You can select different fonts, background colors, and colors for the text, and control the layout of the document. It's considered good practice to put formatting in CSS, interactivity in JavaScript, and keep the HTML for the content. HTML5 provides new structural elements—such as `article`, `section`, `footer`, and `header`—putting formatting into the style element and making use of the new elements, called semantic tags, facilitates working with other people. However, even when you're working just with yourself, separating content, formatting, and behavior lets you easily change the formatting and the interactions. Formatting, including document layout, is a large topic. In this book, I stick to the basics.

Using Cascading Style Sheets

CSS is a special language just for formatting. A style is essentially a rule that specifies how a particular element will be formatted. This means you can put style information in a variety of places: a separate file, a `style` element located in the `head` element, or a style within the HTML document, perhaps within the one element you want to format in a particular way. The styling information cascades, trickles down, unless a different style is specified. To put it another way, the style closest to the element is the one that's used. For example, you might use your official company fonts as given in the style section in the `head` element to flow through most of the text, but include specification within the local element to style one particular piece of text. Because that style is closest to the element, it is the one that is used.

The basic format includes an indicator of what is to be formatted followed by one or more directives. In the examples for this chapter, I'll specify the formatting for elements of type `section`, namely a border or box around each item, margins, padding, and alignment, and a background of white. The complete HTML document in Listing 1-1 is a mixture (some would say a mess!) of features. The elements `body` and `p` (paragraph) are part of the original version of HTML. The `section` element is one of the new element types added in HTML5. The section element does need formatting, unlike `body` and `p`, which have default formatting that the body and each `p` element will start on a new line. CSS can modify the formatting of old and new element types. Notice that the background color for the text in the section is different from the background color for the text outside the section.

In the code in Listing 1-1, I specify styles for the `body` element (there is just one) and the `section` element. If I had more than one section element, the styling would apply to each of them. The style for the body specifies a background color and a color for the text. In the beginning, browsers accepted a set of only 16 colors by name, including black, white, red, blue, green, cyan, and pink. However, now the up-to-date browsers accept 140 colors by name. See https://www.w3schools.com/colors/colors_names.asp.

You can also specify color using RGB (red green blue) hexadecimal codes, but you'll need to use a graphics program—such as Adobe Photoshop, Corel Paint Shop Pro, or Adobe Flash Professional—to figure out the RGB values, or you can experiment. I used Paint Shop Pro to determine the RGB values for the green in the frog head picture and used that for the border as well.

The `text-align` directives are just what they sound like: they indicate whether to center the material or align it to the left. The `font-size` sets the size of text in pixels. Borders are tricky and don't appear to be consistent across browsers. Here I've specified a solid green border of 4 pixels. The `width` specification for `section` indicates that the browser should use 85 percent of the window, whatever that is. The specification for `p` sets the width of the paragraph at 250 pixels. Padding refers to the spacing between the text and the borders of the section. The margin is the spacing between the section and its surroundings.

Listing 1-1. A Complete HTML Document with Styles

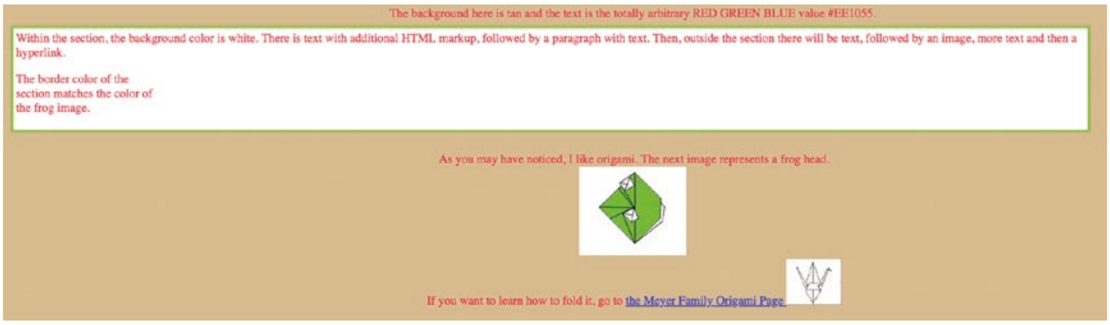
```
<html>
<head>
<title>CSS example </title>
<style>
body {
        background-color:tan;
        color: #EE015;
        text-align:center;
        font-size:22px;
}
section {
        width:85%;
        border:4px #00FF63 solid;
        text-align:left;
        padding:5px;
        margin:10px;
        background-color: white;
}
```

```
p {
        width: 250px;
}
</style>
</head>
<body>
The background here is tan and the text is the totally arbitrary RED
GREEN BLUE➥
 value #EE1055<br/>
<section>Within the section, the background color is white. There is
 text with➥
 additional HTML markup, followed by a paragraph with text. Then,
 outside the➥
 section there will be text, followed by an image, more text and then a➥
 hyperlink. <p>The border color of the section matches the color of the➥
 frog image. </p></section>
<br/>
As you may have noticed, I like origami. The next image represents a frog
head.<br/>
<img src="frogface.gif"/> <br/>If you want to learn how to fold it,
go to

<a href=http://faculty.purchase.edu/jeanine.meyer/origami>the Meyer
 Family➥
 Origami Page <img src="crane.png" width="100"/></a>

</body>
</html>
```

This produces the screen shown in Figure 1-6.



The background here is tan and the text is the totally arbitrary RED GREEN BLUE value #EE1055.

Within the section, the background color is white. There is text with additional HTML markup, followed by a paragraph with text. Then, outside the section there will be text, followed by an image, more text and then a hyperlink.

The border color of the
section matches the color of
the frog image.

As you may have noticed, I like origami. The next image represents a frog head.

If you want to learn how to fold it, go to the Meyer Family Origami Page

Figure 1-6. *Sample CSS styles*

Tip Don't be concerned if you don't understand everything immediately. Modify these examples and make up your own. You'll find lots of help on the Web. In particular, see the official source for HTML 5 at `http://dev.w3.org/html5/spec/Overview.html`.

There are many things you can do with CSS. You can use it to specify formatting for types of elements, as shown here; you can specify that elements are part of a class; and you can identify individual elements using the `id` attribute. In Chapter 6, where we create a quiz, I use CSS to position specific elements in the window and then JavaScript to move them around.

JavaScript Programming

JavaScript is a programming language with built-in features for accessing parts of an HTML document, including styles in the CSS element. It is termed a scripting language to distinguish it from compiled languages, such as C++. Compiled languages are translated all at once, prior to use, while scripting languages are interpreted line by line by browsers. This text assumes no prior programming experience or knowledge of JavaScript, but it may help to consult other books, such as *Getting Started with JavaScript*, by Terry McNavage (friends of ED, 2010), or online sources such as `http://en.wikipedia.org/wiki/JavaScript`. Each browser owns its version of JavaScript.

An HTML document holds JavaScript in a `script` element, located in the `head` element. To display the time and date information as shown in Figure 1-2, I put the following in the `head` element of the HTML document:

```
<script>
document.write(Date());
</script>
```

JavaScript, like other programming languages, is made up of statements of various types. In later chapters, I'll show you assignment statements, compound statements such as `if` and `switch` and `for` statements, and statements that create what are called programmer-defined functions. A function is one or more statements that work together in a block and can be called any time you need that functionality. Functions save writing out the same code over and over. JavaScript supplies many built-in functions. Certain functions are associated with objects (more on this later) and are called methods. The code

```
document.write("hello");
```

is a JavaScript statement that invokes the `write` method of the document object with the argument `"hello"`. An argument is additional information passed to a function or method. Statements are terminated by semicolons. This piece of code will write out the literal string of characters h, e, l, l, o as part of the HTML document.

The `document.write` method writes out anything within the parentheses. Since I wanted the information written out to change as the date and time change, I needed a way to access the current date and time, so I used the built-in JavaScript `Date` function. This function produces an object with the date and time. Later, you'll see how to use `Date` objects to compute how long it takes for a player to complete a game. For now, all I want to do is display the current date and time information, and that's just what this code does:

```
document.write(Date());
```

To use the formal language of programming: this code calls (invokes) the `write` method of the `document` object, a built-in piece of code. The period (`.`) indicates that the `write` to be invoked is a method associated with the document produced by the HTML file. So, something is written out as part of the HTML document. What is written out? Whatever is between the opening parenthesis and the closing parenthesis. And what is that? It is the result of the call to the built-in function `Date`. The `Date` function gets information maintained by the local computer and hands it off to the `write` method. `Date` also requires the use of parentheses, which is why you see so many. The `write` method displays the date and time information as part of the HTML document, as shown in Figure 1-2. The way these constructs are combined is typical of programming languages. The statement ends with a semicolon. Why not a period? A period has other uses in JavaScript, such as indicating methods and serving as a decimal point for numbers.

Natural languages, such as English, and programming languages have much in common—different types of statements; punctuation using certain symbols; and grammar for the correct positioning of elements. In programming, we use the term notation instead of punctuation, and syntax instead of grammar. Both programming languages and natural languages also let you build up very complex statements out of separate parts. However, there is a fundamental difference: As I tell my students, chances are good that much of what I say in class is not grammatically correct, but they'll still understand me. But when you're "talking" to a computer via a programming language, your code must be perfect in terms of the grammatical rules of the language to get what you want. The good news is that unlike a human audience, computers do not exhibit impatience or any other human emotion so you can take the time you need to get things right. There's also some bad news that may take you a while to appreciate. If you make a mistake in grammar—termed a syntactic error—in HTML, CSS, or JavaScript, the browser still tries to display something. It's up to you figure out what and where the problem is when you don't get the results you wanted in your work.

Using a Text Editor

You build an HTML document using a text editor and you view/test/play the document using a browser. Though you can use any text editor program to write the HTML, I suggest TextPad for PCs and Sublime for Macs. These are shareware, which makes them relatively inexpensive. Don't use a word processing program, which may insert non-text characters. Notepad also works, although the other tools have benefits such as color-coding that I'll demonstrate. To use the editor, you open it and type in the code. Figure 1-7 shows what the Sublime screen looks like.