15 Fun Coding Projects!

JavaScript® FOR KIDS

- Build an Animated Robot App
- Create Cool Games
- Make a Web Page
- Learn Real Coding Skills

Chris Minnick
Eva Holland
Cofounders of WatzThis?

FOR DUMMIES®
A Wiley Brand

Introduction

JavaScript For Kids For Dummies is an introduction to the basics of JavaScript coding. In each chapter, we walk you step-by-step through creating JavaScript programs for the web. Designed for kids of all ages, with no coding experience, we strive to introduce this technical topic in a fun, engaging, and interactive way.

JavaScript is the most widely used programming language in the world today. That's why we think you've made a great decision by beginning your journey into the world of coding by picking up this book.

JavaScript is fun and easy to learn! With some determination and imagination, you'll be on your way to creating your very own JavaScript programs in no time!

Just as the only way to Carnegie Hall is to practice, practice, practice, the only way to become a better programmer is to code, code, code!

About This Book

We seek to "de-code" the language of JavaScript for you and give you an understanding of the concepts. With the ability to move at your own pace, *JavaScript For Kids For Dummies* will get you up to speed. In this book, you learn how to create fun games and programs. We even show you how to customize and build your own versions of the games that you can post to the web and share with your friends!

Whether you know a little JavaScript or you've never seen it before, this book shows you how to write

JavaScript the right way.

Topics covered in this book include the following:

- The basic structures of JavaScript programs
- JavaScript expressions and operators
- Structuring your programs with functions
- Writing loops
- Working with JavaScript, HTML5, and CSS3
- Making choices with `if…else` statements

Learning JavaScript isn't only about learning how to write the language. It's also about accessing the tools and the community that has been built around the language. JavaScript programmers have refined the tools and techniques used to write JavaScript over the language's long and exciting history. Throughout this book, we mention important techniques and tools for testing, documenting, and writing better code!

To make this book easier to read, you'll want to keep in mind a few tips. First, all JavaScript code and all HTML and CSS markup appears in monospaced type like this:

```
document.write("Hi!");
```

The margins on a book page don't have the same room as your monitor likely does, so long lines of HTML, CSS, and JavaScript may break across multiple lines. Remember that your computer sees such lines as single lines of HTML, CSS, or JavaScript. We indicate that everything should be on one line by breaking it at a punctuation character or space and then indenting any overage, like so:

```
document.getElementById("thisIsAnElementInTheDocument").addEventListener("cli
  ck",doSomething,false);
```

HTML and CSS don't care very much about whether you use uppercase or lowercase letters or a combination of the two. But, JavaScript cares a lot! In order to make sure that you get the correct results from the code examples in the book, always stick to the same capitalizations that we use.

Foolish Assumptions

You don't need to be a "programming ninja" or a "hacker" to understand programming. You don't need to understand how the guts of your computer work. You don't even need to know how to count in binary.

However, we do need to make a couple of assumptions about you. We assume that you can turn your computer on, that you know how to use a mouse *and* a keyboard, and that you have a working Internet connection and web browser. If you already know something about how to make web pages (it doesn't take much!), you'll have a jumpstart on the material.

The other things you need to know to write and run JavaScript code are details we cover in this book, and the one thing you'll find to be true is that programming requires attention to details.

Icons Used In This Book

Here's a list of the icons we use in this book to flag text and information that's especially noteworthy.

This icon highlights technical details that you may or may not find interesting. Feel free to skip this information, but if you're the techie type, you might enjoy reading it.

This icon highlights helpful tips that show you easy ways or shortcuts that will save you time or effort.

Whenever you see this icon, pay close attention. You won't want to forget the information you're about to read — or, in some cases, we'll remind you about something that you've already learned that you may have forgotten.

Be careful. This icon warns you of pitfalls to avoid.

Beyond the Book

We've put together a lot of extra content that you won't find in this book. Go online to find the following:

- **Cheat Sheet:** An online Cheat Sheet is available at `www.dummies.com/cheatsheet/javascriptforkids`. Here, you find information on converting CSS property names to JavaScript; a list of common web browser events that JavaScript can respond to; and a list of words that can't be used as JavaScript variables, functions, methods, loop labels, or object names.

- **Web Extras:** Online articles covering additional topics are available at `www.dummies.com/extras/javascriptforkids`. In these articles, we cover things like HTML5 form input tricks, how to name JavaScript variables, JavaScript troubleshooting tips, and more.

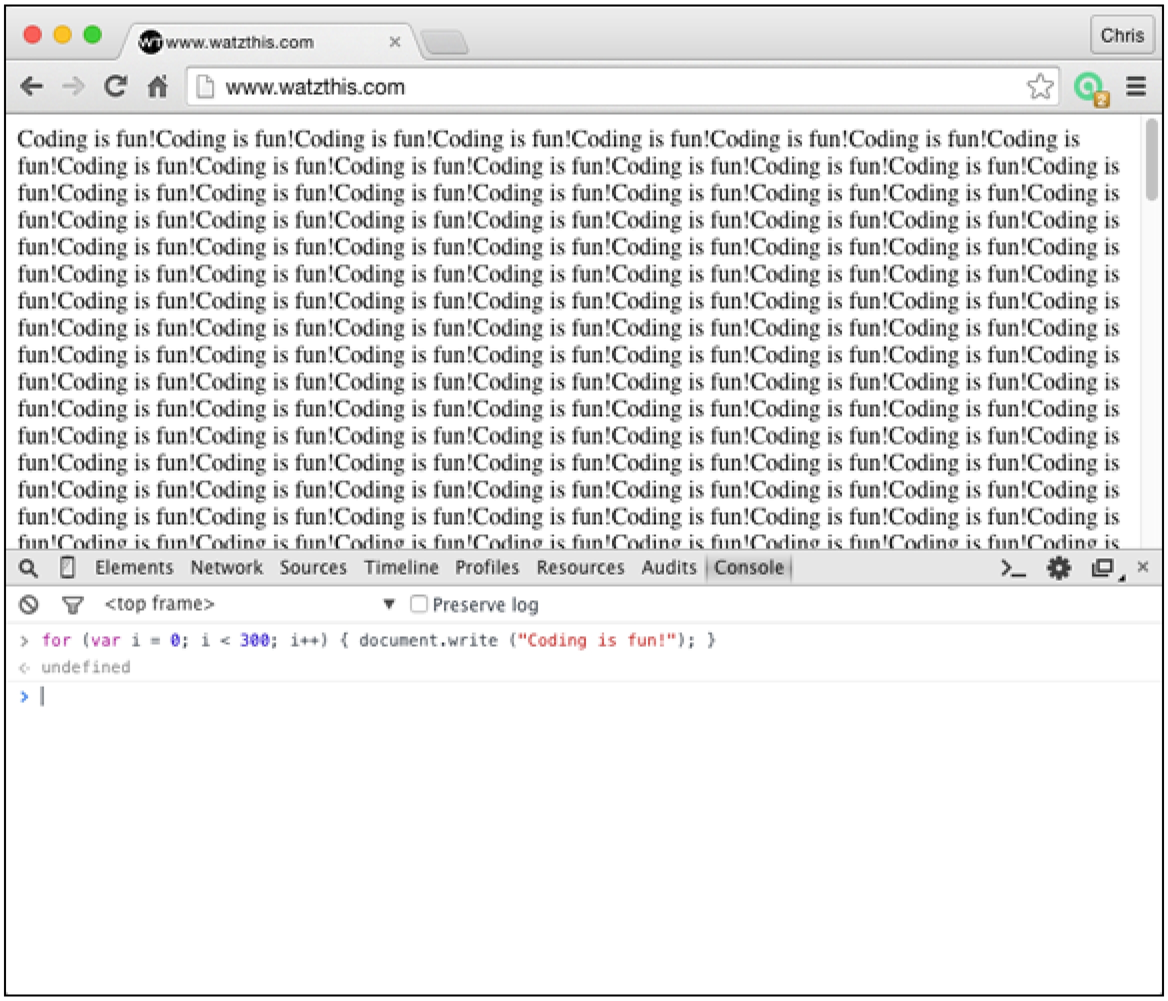
Where to Go from Here

Coding with JavaScript is fun, and when you get a little knowledge under your belt, the world of interactive web applications is your oyster! So buckle up! We hope you enjoy the book and our occasional pearls of wisdom.

If you want to show us changes and improvements you make to our games, or programs you come up with on your own, you can do so on Facebook (`www.facebook.com/watzthisco`), Twitter (`www.twitter.com/watzthisco`), or via email at `info@watzthis.com`. We're excited to see what you come up with!

Part I

What Is JavaScript? Alert! JavaScript Is Awesome!



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```
> for (var i = 0; i < 300; i++) { document.write ("Coding is fun!"); }
<· undefined
> |
```

In this part …

- Programming the Web
- Understanding Syntax
- Giving and Receiving Data
- Fiddling with Web Applications

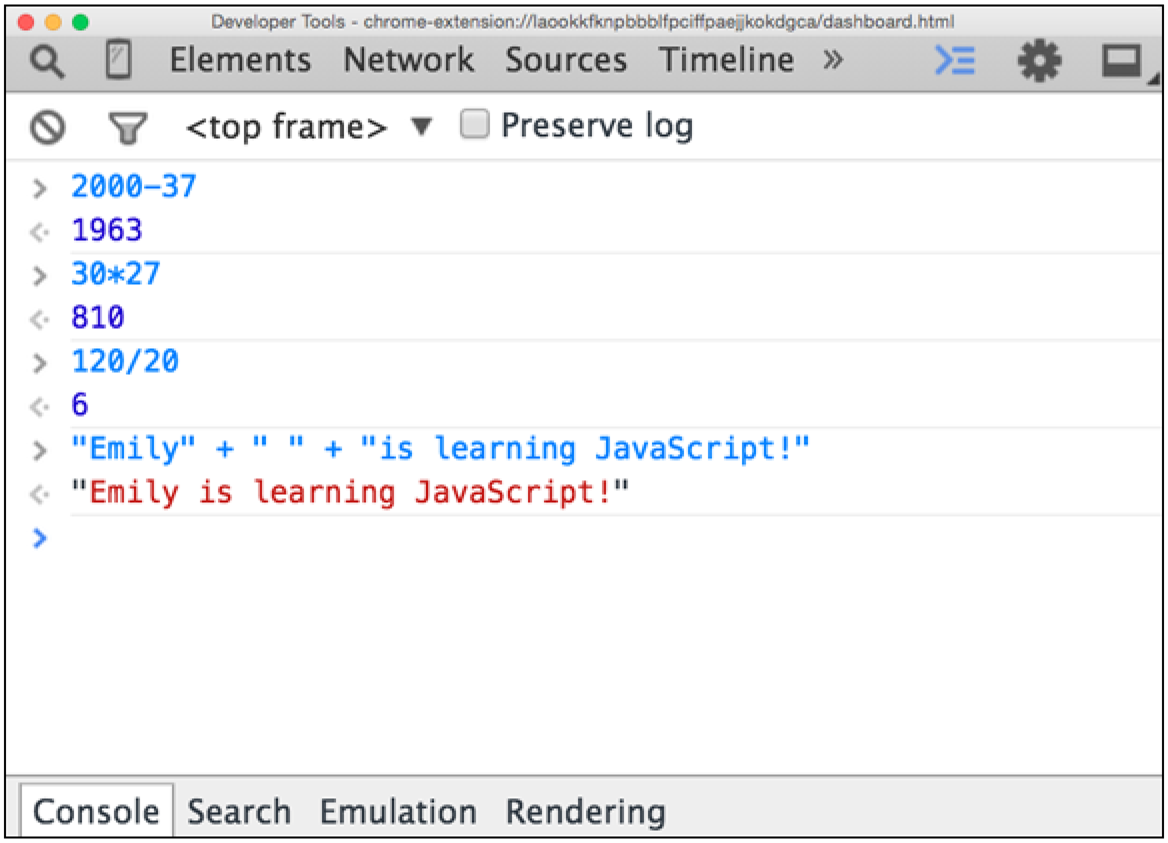
For Dummies can help you get started with lots of subjects. Visit `www.dummies.com` to learn more and do more with *For Dummies!*

Chapter 1

Programming the Web

JavaScript is a powerful language that's easy to learn! In this chapter, we explain the basics of programming, tell you what JavaScript is, and get you started with writing your first JavaScript commands.

One of the most important parts of starting any new project is to make sure you have your workshop stocked with all the correct tools. In this chapter, you install and configure all the programs you need and start experimenting with some real JavaScript programs!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Emulation
Rendering

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> 30*27
< 810
> 120/20
< 6
> "Emily" + " " + "is learning JavaScript!"
< "Emily is learning JavaScript!"
>
```

What Is Programming?

A *computer program* is a series of instructions that can be understood and followed by a computer. *Computer programming,* also known as *coding,* is what we call it when we write these instructions. Computers can't do things on their own. They need a computer program to tell them what to do. Computer programmers write code to make computers do all sort of things.

The women who invented programming

Electronic computers as we know them were first invented in the 1930s. But it was the middle of the 1800s when the first computer program — a set of instructions designed to be carried out by a machine — was written.

The author of the first computer program — and, therefore, the world's first computer programmer — was a woman named Ada Lovelace. A mathematician in England, she was the first person to envision computers that could do much more than just crunch numbers. She foresaw computers being able to do all the things we use computers for today: including working with words, displaying pictures, and playing music. Her unique insights earned her the nickname "The Enchantress of Numbers."

Compilers are programs for converting programming languages into machine language. The first compiler was created by Grace Murray Hopper in 1944. This invention led to computer programs that could run on different types of computers, and eventually to JavaScript. Hopper is also credited with being the inventor of the term *debugging* for fixing problems in computer programs. The term was inspired by the removal of an actual moth from an early computer. Hopper became known as "The Queen of Software" or "Amazing Grace" for her contributions to modern computing.

TECHNICAL STUFF

Another name for a computer program is *software.*

Computer programs help people to do many thousands of things, including the following:

- Playing music and videos
- Performing scientific experiments
- Designing cars
- Inventing medicines
- Playing games
- Controlling robots
- Guiding satellites and spaceships
- Creating magazines
- Teaching people new skills

Can you think of more examples of things that computers can do?

Talking to Computers

At the heart of every computer is a central processing unit (CPU). This CPU is made up of millions of tiny, very fast switches (called *transistors*) that can be either on or off. The position of each of these switches at any time determines what the computer will do.

Software written by programmers tells these switches when to turn on or off and in what combination by using *binary codes.* Binary codes use zeros and ones to form letters, numbers, and symbols that can be put together in order to perform tasks.

Every single thing that a computer does is the result of a different combination of many zeros and ones. For example, to represent a lowercase letter *a,* computers use the following binary code:

```
0110 0001
```

Each zero or one in a binary number is called a *bit,* and a combination of eight bits is called a *byte.* When you hear the words *kilobyte, megabyte,* and *gigabyte* used to tell how big a file is, what it's talking about is the number of eight-bit binary codes it takes to store the file.

Table 1-1 lists the most commonly used storage sizes.

Table 1-1 How Many Bytes Is That?

Name	***Number of Bytes***	***What It Can Store***
Kilobyte (KB)	1,024	Two to three paragraphs of text
Megabyte (MB)	1,048,576	800 pages of text
Gigabyte (GB)	1,073,741,824	250 songs (as MP3s)
Terabyte (TB)	1,099,511,627,776	350,000 digital pictures
Petabyte (PB)	1,125,899,906,842,624	41,943 Blu-ray discs

A typical small computer program might contain anywhere from a couple kilobytes to a couple megabytes of instructions, images, and other data. Because it's unlikely that you have enough time in your busy day to type out thousands, or even millions, of ones and zeros, if you want to tell a computer what to do, you need a translator who speaks both human languages and computer (or *machine*) language. Computer programming languages are this translator.

Every computer program is written using a computer programming language. Programming languages allow you to write complex series of instructions that can be translated (also known as *compiled*) into machine language. Through compilation, these instructions are eventually turned into binary codes that a computer can understand.

Choosing a Language

People have created hundreds of different computer programming languages. You might ask yourself why there are so many programming languages, if they all essentially do the same thing: translate human language into machine language. That’s an excellent question!

There are a few main reasons why there are so many different programming languages. New programming languages are written to allow programmers to

- Write programs in new and better ways than were previously available.
- Write programs for new or specialized types of computers.
- Create new kinds of software.

Examples of computer programming languages include the following:

- C
- Java
- JavaScript
- Logo
- Objective C
- Perl
- Python
- Ruby
- Scratch
- Swift
- Visual Basic

Our short list of programming languages only scratches the surface. For a more complete list of programming languages, visit `http://en.wikipedia.org/wiki/List_of_programming_languages`.

With so many programming languages to choose from, how do you know which one to use? In many cases, the answer is determined by what you want to do with the languages. For example, if you want to program apps for the iPhone, you have three choices: Objective C, JavaScript, or Swift. If you want to program games to run on Mac or Windows, you have more choices, including C, Java, or JavaScript. If you want to make an interactive website, you need to use JavaScript.

Are you seeing a pattern here? JavaScript is everywhere.

What Is JavaScript?

In the early days of the web, every web page consisted of nothing but plain text in different sizes with links between pages. There were no web forms, there certainly wasn’t any animation, and there weren’t even different styles of text or pictures!

We’re not complaining! When the web was new, it was exciting to click from page to page and discover new things. Even more exciting was how easy the web made it for anyone to be able to publish anything at all and have the potential for anyone else on the Internet to read it.

But when people got a taste of what the web could do, they wanted more features! Graphics, text colors, forms, and many other features were introduced very quickly.

Of all the things that were invented in the earliest days of the web, the thing that has had the biggest impact over the longest time was JavaScript.

JavaScript was created in order to make it possible for web browsers to be interactive. Interactive web pages can range from simple forms that provide feedback when you make a mistake, to 3D games that run in your web browser. Whenever you visit a website and see something moving, or you see data appearing and changing on the page, or you see interactive maps or browser-based games, chances are, it's JavaScript at work.

To see some examples of websites that are made possible by JavaScript, open up your web browser and visit the following sites:

- **ShinyText (`http://cabbi.bo/ShinyText`):** ShinyText is an experimental website that uses JavaScript to display a word. You can adjust different properties of the word, such as Reflection Power and Repulsion Power to see what effect these changes have on how the letters in the word react when you move them around with your mouse. Figure 1-1 shows ShinyText in action.

  Even if you don't understand how it works (we sure don't!), ShinyText is fun to play with, and it's a great example of what's possible with JavaScript.

- **Interactive Sock Puppet (`www.mediosyproyectos.com/puppetic`):** Interactive Sock Puppet is another 3D animation. This time, you can control the movements and facial expressions of a JavaScript puppet. Figure 1-2 shows the Interactive Sock Puppet looking quite happy.

- **Facebook (www.facebook.com):** Facebook uses a lot of JavaScript (see Figure 1-3). When you see a smooth animation or video playback, or when a list of posts updates by itself, that's JavaScript at work!

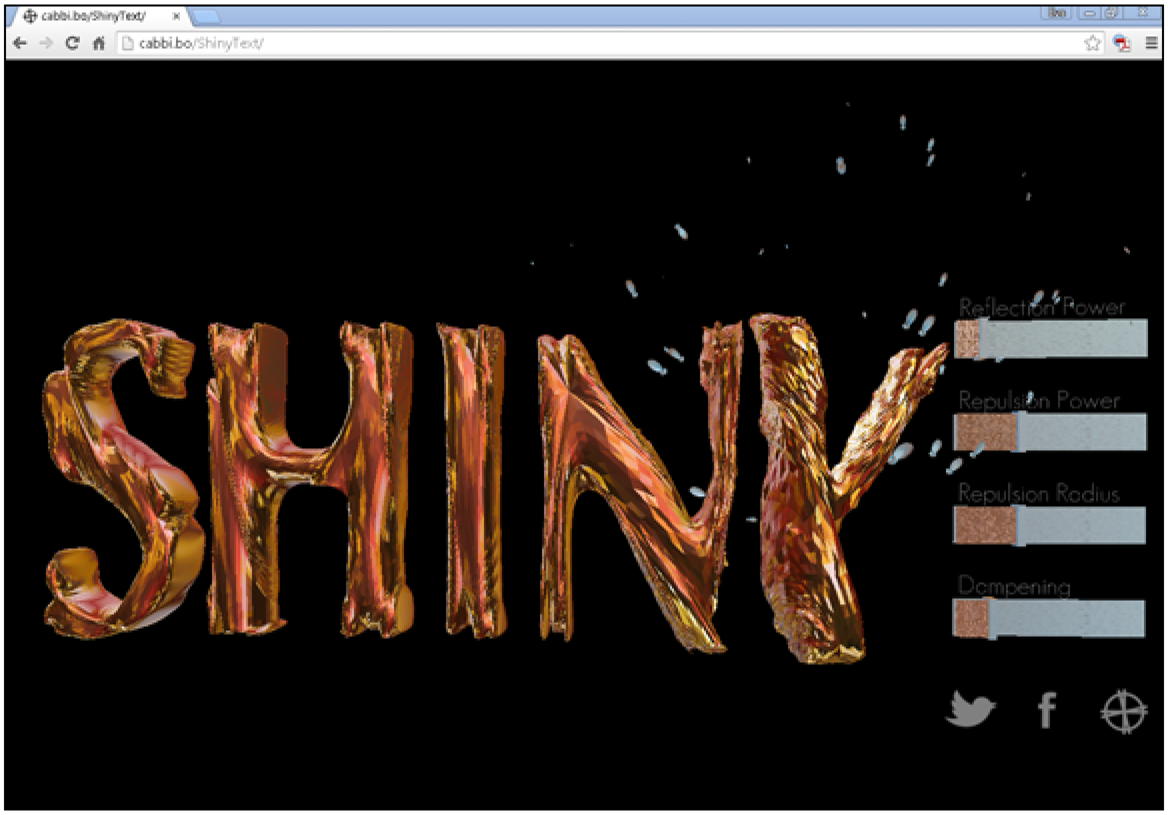
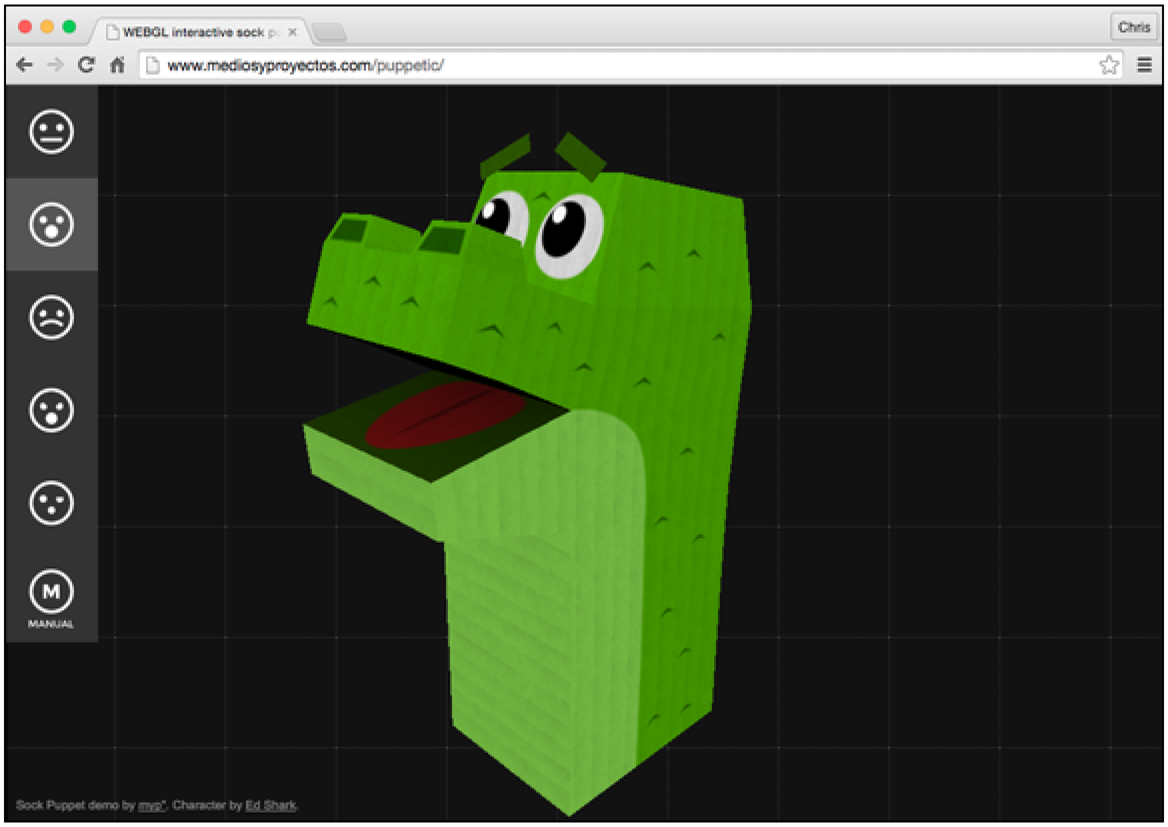


Figure 1-1: ShinyText uses JavaScript to produce a 3D physics simulation.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Chris
www.mediosyproyectos.com/puppetic/
MANUAL
Sock Puppet demo by mvp*. Character by Ed Shark.

Figure 1-2: Interactive Sock Puppet lets you control a JavaScript dinosaur sock puppet.

We believe that curiosity, humor, fun, and excitement are essential parts of learning even the most technical skills.

http://www.watzthis.com/

WatzThis? with Eva Rose and Chris Minnick
Posted by Chris Minnick [?] · Yesterday at 7:25am · Edited ·

Thanks, friends for helping to get the word out about our upcoming book Coding with JavaScript for Dummies by Chris Minnick and Eva Holland!

About 6 weeks and counting until it's on shelves near you, but you can pre-order any time (and get a giant discount!) http://goo.gl/PDHo2h

Figure 1-3: Facebook uses JavaScript to do everything.

Some of these examples use some very advanced features of web browsers. We recommend that you use the latest version of Google Chrome to view these. The examples may not work in older web browsers.

Get Your Browser Ready

The one essential tool that you need for working with JavaScript is a web browser. You have many different web browsers to choose from, and nearly all of them will do a great job running JavaScript. Odds are, you already have a web browser on your computer.

The most widely used web browsers today are Firefox, Safari, Chrome, Internet Explorer, and Opera. For this book, we'll be using Chrome. Google Chrome is currently the most popular web browser. It has a number of great tools for working with JavaScript.

If you don't already have Chrome installed, you'll need to download and install it. You can install Chrome by opening any web browser and going to `www.google.com/chrome/browser/desktop`. Follow the instructions found on that page to install Chrome on your computer. When you have Chrome installed, start it up.

In the next section, we show you the Chrome Developer Tools, which help website designers and JavaScript programmers to see exactly what's going on inside the browser so they can write better web pages and programs.

Opening the Web Developer Tools

After you have Chrome installed and launched, look at the top of the browser window. In the upper-right corner, you see three lines. This is the icon for the Chrome menu. If you expand the Chrome menu, you see a list of options similar to those shown in Figure 1-4.

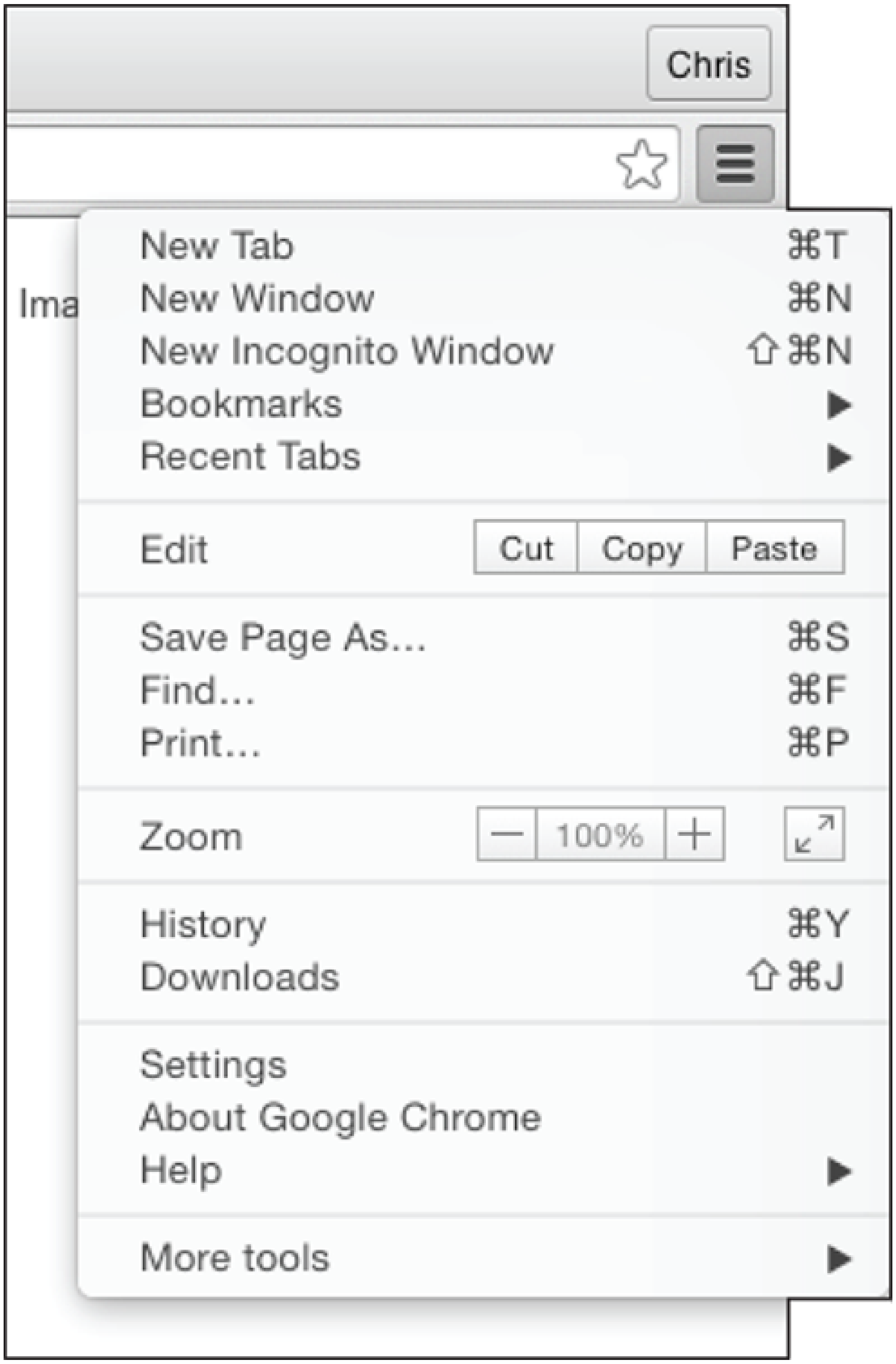


Figure 1-4: The Chrome menu.

If you scroll down to the bottom of this menu and select More Tools, a new menu of options appears, as shown in

Figure 1-5. These secret tools are the JavaScript coder's best friends.

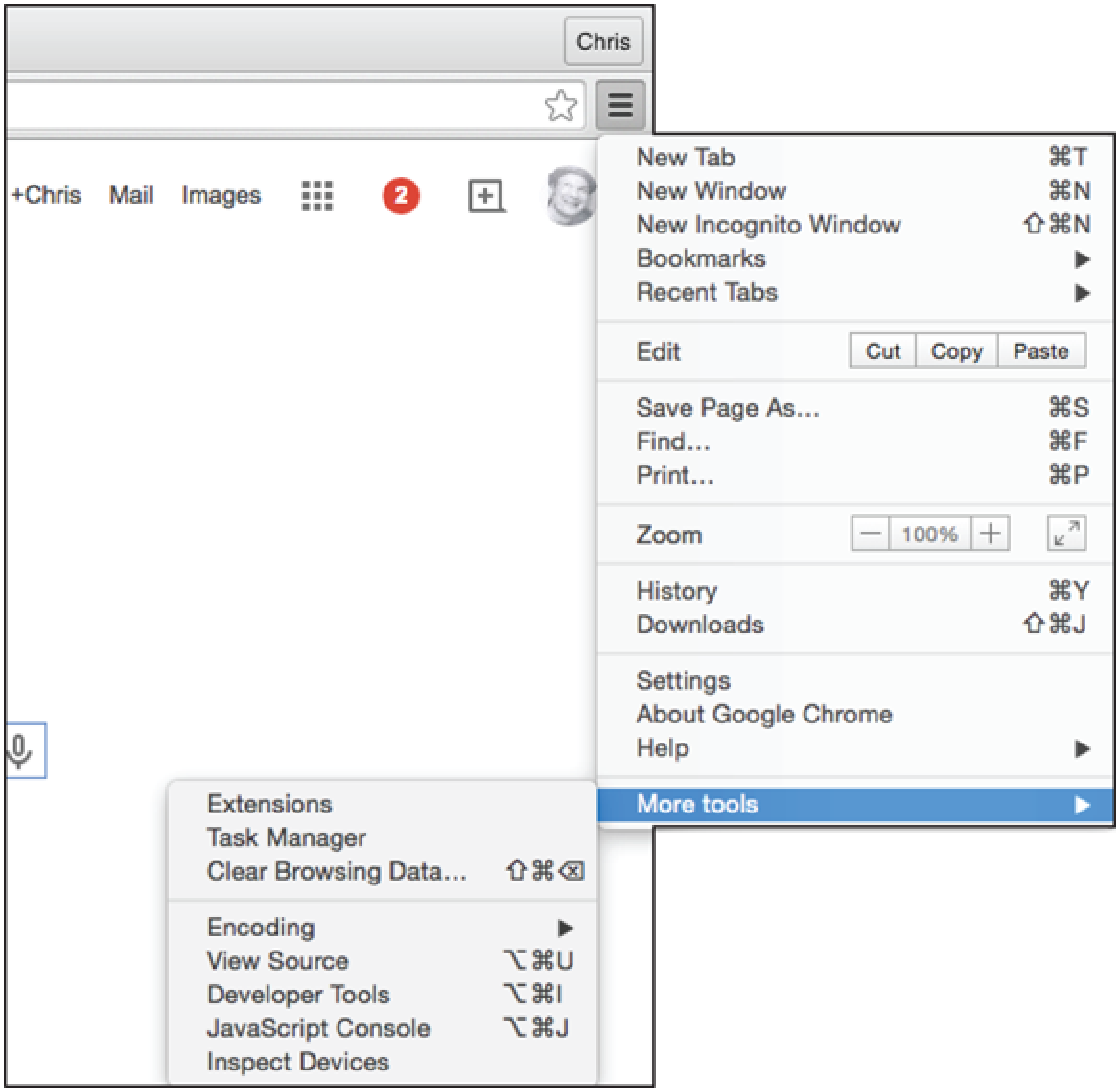
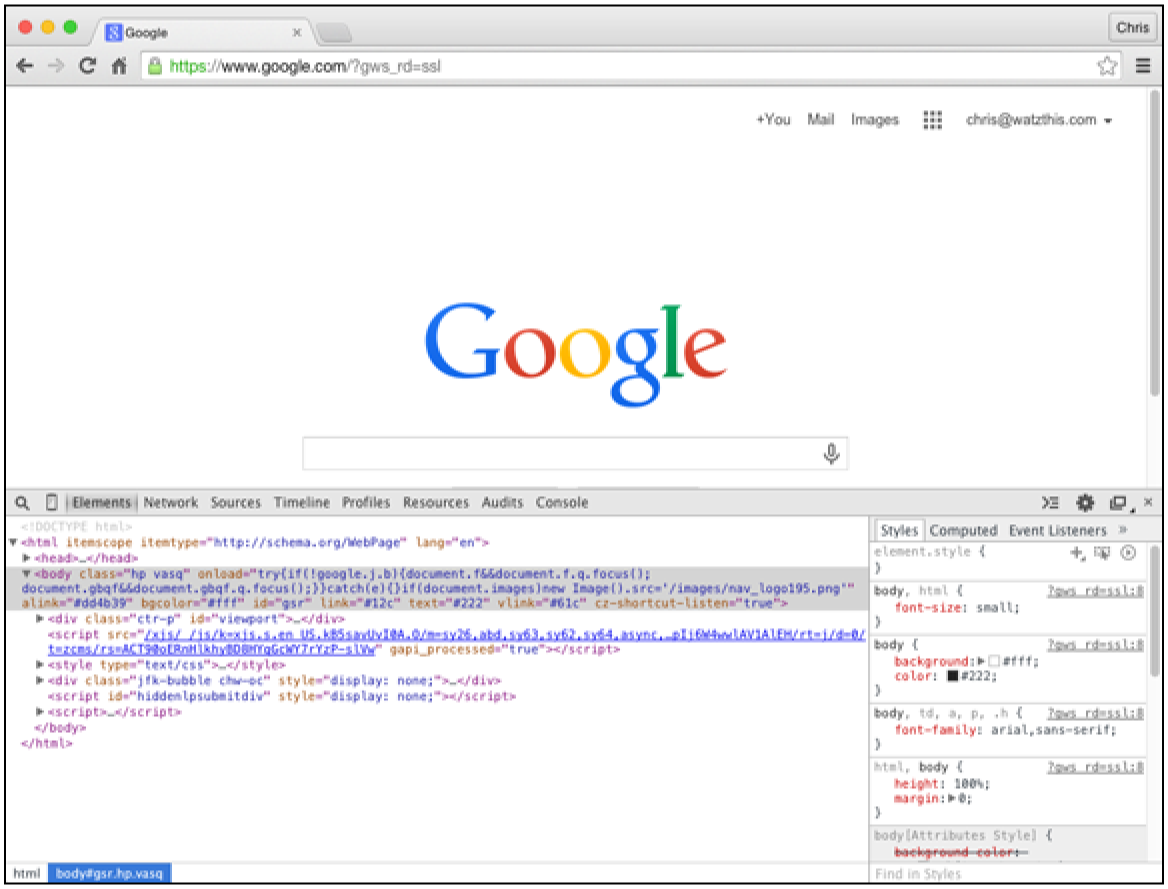


Figure 1-5: The More Tools menu.

Select Developer Tools from the More Tools menu. A new panel opens at the bottom of your browser window that looks like Figure 1-6.



```
<!DOCTYPE html>
▼<html itemscope itemtype="http://schema.org/WebPage" lang="en">
 ▶<head>…</head>
 ▼<body class="hp vasq" onload="try{if(!google.j.b){document.f&&document.f.q.focus();
 document.gbqf&&document.gbqf.q.focus();}}catch(e){}if(document.images)new Image().src='/images/nav_logo195.png'"
 alink="#dd4b39" bgcolor="#fff" id="gsr" link="#12c" text="#222" vlink="#61c" cz-shortcut-listen="true">
   ▶<div class="ctr-p" id="viewport">…</div>
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    <script id="hiddenlpsubmitdiv" style="display: none;"></script>
   ▶<script>…</script>
  </body>
</html>
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element.style {
}
body, html {                    ?gws_rd=ssl:8
   font-size: small;
}
body {                          ?gws_rd=ssl:8
   background:▶ #fff;
   color: #222;
}
body, td, a, p, .h {            ?gws_rd=ssl:8
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}
html, body {                    ?gws_rd=ssl:8
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   margin:▶ 0;
}
body[Attributes Style] {
   ~~background-color:~~ —
```

Figure 1-6: The Developer Tools.

The Developer Tools give you all the information you need for finding out how any web page works, for testing and improving your own web pages and JavaScript programs, and much more.

Notice that the there's a menu at the top of the Developer Tools with different options, including Elements, Network, Sources, Timeline, Profiles, Resources, Audits, and Console. If you click each of these, you'll see a different set of options and data in the Developer Tools panel.

We describe the different components of the Developer Tools as they become necessary throughout this book, but for now, the most important part of the Developer

Tools is the one labeled Console. Click the Console tab now.

Introducing the JavaScript Console

The Developer Tools Console, also known as the JavaScript Console, shown in Figure 1-7, gives you information about the JavaScript that's currently running in the browser window.

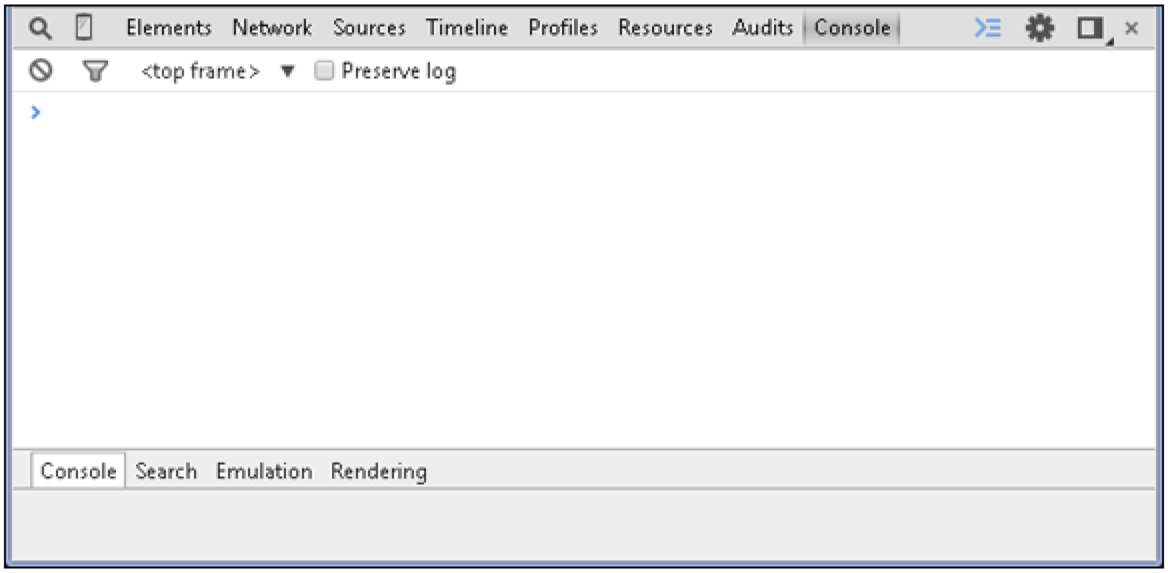


Figure 1-7: The JavaScript Console.

If there are errors in the JavaScript code of a web page, you see information about the errors in the console. This is a very helpful tool and one of the main features of the JavaScript Console.

Another very cool capability of the console is that you can type JavaScript into the console panel and it will run. In the next section, you learn why this is useful and how to do it.

The JavaScript Console is a useful tool for JavaScript programmers, but it also has the potential to be misused. If someone you don't know or trust asks you to paste code into the JavaScript Console, make sure you understand what that code does first.

Running Your First JavaScript Commands

Now it's time to start experimenting with some real JavaScript code! If you don't already have it open, open the JavaScript Console by selecting it from the Other Tools menu under the Chrome menu, or by clicking the Console tab in the Developer Tools.

Follow these steps to run your first JavaScript commands:

1. Click inside the JavaScript console, near the >, to start inserting code.
2. Type **1 + 1** and then press Return (Mac) or Enter (Windows).

   The browser gives you the answer on the next line.

Notice that when the answer is returned to you, it has an arrow on the left side of it that points to the left. This arrow indicates that the value came from JavaScript rather than from your input. Any value that comes from JavaScript is called a *return value.* Every command that you run in JavaScript produces some sort of return value.

Simple math is one thing, but JavaScript can do much, much more. Let's try out some other commands and see just how quickly we can get some answers around here.

Before we get started, let’s clean up the console and remove any previous commands, errors, and return values in there. To clear the console, look at the upper-left corner and click the circle with the line through it. Everything inside the console will be erased, and now you’ve got a clean slate.

Click your mouse next to the > and try out the following JavaScript commands. Make sure to press Return (Mac) or Enter (Windows) after each one to see the results.

JavaScript Command	***Description***
`2000 – 37`	This is a simple math problem, but this time we’re using the minus sign to subtract the number on the right from the number on the left.
`30 * 27`	The asterisk (*) is how you tell JavaScript to multiply numbers.
`120 / 20`	The forward slash (/) tells JavaScript to divide the number on the left by the number on the right.
`"Your name" + " " + "is learning JavaScript!"`	Yes, you can add words together with JavaScript! When you run a command that adds words together, it’s called *concatenation.* The result will be that the words are combined into a single word.
	Notice that the words in the above JavaScript command are inside quotes. These quotes are very important. We tell you exactly why they’re important in Chapter 2.
`Your name + + is learning JavaScript!`	When you don’t use quotes, JavaScript doesn’t like that one bit. It returns an error message containing the keyword `SyntaxError`. A syntax error means that you’ve written something that isn’t valid JavaScript. Any time you see a syntax error, it means that you’ve goofed. Take a close look at your code and look for typos, missing punctuation, or missing quotes.

Having Fun with Math

Now it’s your turn to try out some math problems on your own! Clear out your commands and the return values and errors from the previous section and experiment with the console.

Here are some ideas to get you started:

- Multiply together two decimal numbers.
- Run multiple commands in one line (for example, `1 + 1 * 4 / 8`).
- Type a number without any symbols at all and then run it.
- Add a word (remember to use quotes!) to a number (without quotes).
- Add a number (without quotes) to a word (with quotes).
- Combine your first name with the last name of your celebrity crush. Remember to add a space between the first and last name! For example, `"Eva" + " " + "Harry Styles"`.
- Try to produce extremely large return values.
- Try to produce extremely small return values.
- Try to do an impossible math problem, such as dividing a number by zero.
- Try multiplying a number by a word (in quotes). For example, `343 * "hi!"`. The result of this will be NaN, which stands for “not a number.”

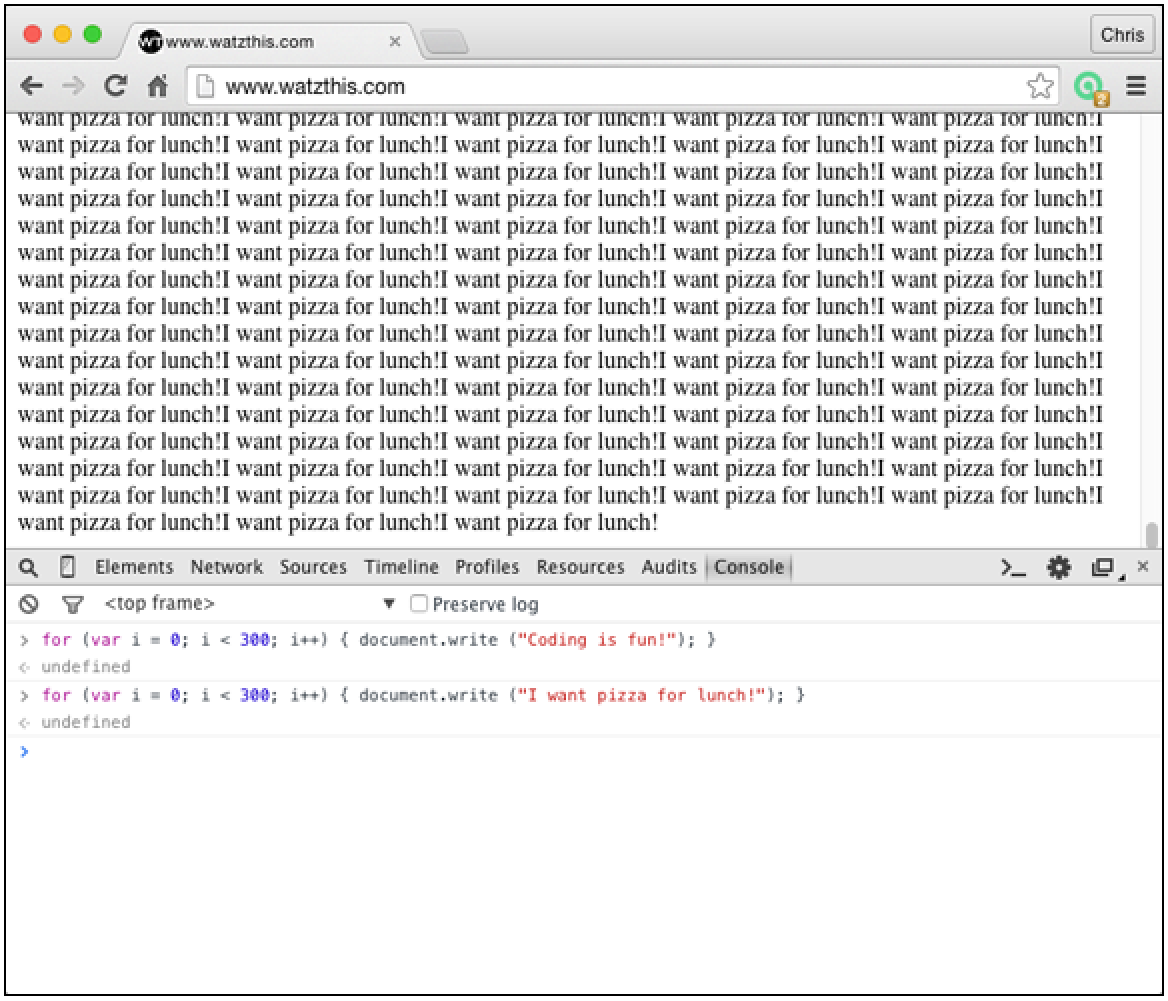
Chapter 2

Understanding Syntax

Just as spoken languages have rules (called *grammar*), computer programming languages have rules (called *syntax*). When you understand the basic rules of speaking JavaScript, it actually looks similar to English.

If you thought that your teacher correcting you when you say “ain’t” was strict, wait until you see how strict JavaScript is! It won’t even listen to a thing you say if you make certain kinds of syntax errors.

In this chapter, you learn the basics of JavaScript syntax and how to avoid being scolded by the syntax police!



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want pizza for lunch!I want pizza for lunch!I want pizza for lunch!I want pizza for lunch!I want pizza for lunch!I
want pizza for lunch!I want pizza for lunch!I want pizza for lunch!
```

```
> for (var i = 0; i < 300; i++) { document.write ("Coding is fun!"); }
<· undefined
> for (var i = 0; i < 300; i++) { document.write ("I want pizza for lunch!"); }
<· undefined
>
```

Saying Precisely What You Mean

In order to be compiled correctly into machine language instructions, programs need to be written very precisely.

Chapter 1 explains what a program is and how programs are translated into machine language using the process called *compilation*.

As a programmer, your job is to think about the big picture of what you want the program to do, and then break it down into bite-size steps that can be accomplished by the computer without errors. For example, if you wanted to ask a robot to go downstairs and get you a sandwich, you might start your instructions like this:

1. Rotate head toward stairs.
2. Use visual sensors to look for obstacles.
3. If an obstacle is found, determine what it is.
4. If the obstacle is a cat, try to lure the cat away from the top of the stairs by:
    - Throwing a toy down the hall
    - Speaking the cat’s name
    - Gently nudging the cat with your hand until it walks away
5. If there is no obstacle, rotate left foot in the direction of the stairs.
6. Place left foot in front of right foot.
7. Look for an obstacle.
8. Determine whether you’re at the top of the stairs.
9. If you’re not at the top of the stairs, rotate right foot in the direction of the stairs.
10. Place right foot in front of left foot.
11. Repeat steps 1 through 10 until you’re at the top of the stairs.

You’ve written 11 instructions already and the robot hasn’t even started walking down the stairs, much less making a sandwich!

A real computer program to tell a robot to go downstairs and make a sandwich would need to contain far more