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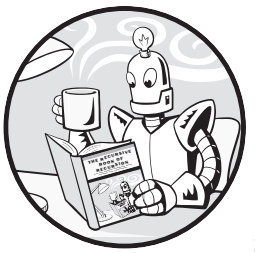
WHAT IS RECURSION?



Recursion has an intimidating reputation. It's considered hard to understand, but at its core, it depends on only two things: function calls and stack data structures.

Most new programmers trace through what a program does by following the execution. It's an easy way to read code: you just put your finger on the line of code at the top of the program and move down. Sometimes your finger will loop back; other times, it will jump into a function and later return. This makes it easy to visualize what a program does and in what order.

But to understand recursion, you need to become familiar with a less obvious data structure, called a *stack*, that controls the program's flow of execution. Most programming beginners don't know about stacks, because programming tutorials often don't even mention them when discussing function calls. Furthermore, the call stack that automatically manages function calls doesn't appear anywhere in the source code.

It's hard to understand something when you can't see it and don't know it exists! In this chapter, we'll pull back the curtain to dispel the overblown notion that recursion is hard, and you'll be able to appreciate the elegance underneath.

The Definition of Recursion

Before we discuss recursion, let's get the clichéd recursion jokes out of the way, starting with this: "To understand recursion, you must first understand recursion."

During the months I've spent writing this book, I can assure you that this joke gets funnier the more you hear it.

Another joke is that if you search Google for *recursion*, the results page asks if you mean *recursion*. Following the link, as shown in Figure 1-1, takes you to . . . the search results for *recursion*.

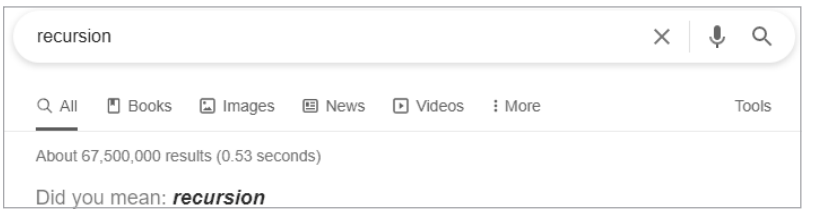


Figure 1-1: The Google search results for recursion *link to the Google search results for* recursion.

Figure 1-2 shows a recursion joke from the webcomic xkcd.

Figure 1-2: I'm So Meta, Even This Acronym (I.S. M.E.T.A.)

Most jokes about the 2010 science-fiction action movie *Inception* are recursion jokes. The film features characters having dreams within dreams within dreams.

And finally, what computer scientist could forget that monster from Greek mythology, the recursive centaur? As you can see in Figure 1-3, it is half horse, half recursive centaur.