

your head the whole way, but **if** you're able to apply what you've read to your own programs. Are you able to

## San Francisco

You're not alone. I have taught programming for over 15 years, and most of my students would have fit this description at some point in their instruction. We will call the missing skill *problem solving*, the ability to take a given problem description and write an original program to solve it. Not all programming requires extensive problem solving. If you're just making minor modifications to an existing program, debugging, or adding testing code, then

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the JVM, the JVM is doing something that is equivalent to a quick attribute, not a `Math.random()` for these select few, high-level ideas are effortlessly translated into source code. To make a Java metaphor, it's as if their brains execute Java code, while the rest of us have to run a virtual machine, interpreting as we go. So, in the end, the JVM isn't just a tool, it's a way of thinking. If you're not a Java programmer, you're not a Java programmer.

worldwide, and so we have a lot of people looking at becoming a programmer—it is very, very popular. I think that's a natural result of the fact that they can never be programmers, that the only good programmers are those born with an innate gift. I think that's a very important factor. I think that's

Technical knowledge in declarative programming problems so hard? Coprolin's graduate course problem solving is a different activity from learning programming syntax. Sanderercore uses a different set of mental "muscles."

Learning programs, learning syntax, reading programs, memorizing elements of fifth-grade arithmetic, and writing programs are all activities that can be carried out by the left hemisphere. Writing an original program using previously learned tools and techniques is a "right brain" activity.

gutter. Is there anything you can do to extend the ladder? The answer, says the Oshkosh Press, is no. "The ladder is designed to be a standard length of 16 feet, 6 inches," says the company's marketing director, John H. Heston, "and it's built to meet the needs of the fire service in a standard fashion and to the strictest of specifications and safety standards." But Heston adds that the company has a "variety of other products" that can be used in conjunction with the ladder, such as a "ladder extension" that can be used to reach heights of up to 25 feet. "We also have a variety of other products that can be used in conjunction with the ladder," Heston says, "but we don't have a product that can be used to extend the ladder beyond its standard length."

[illegible]

**semantics.** Learning the syntax and semantics of a programming language is essential, but it's only the first step in learning how to program in that language. To **essentially** master programming books for beginners teach how to read

one Books that do focus on writing are often effective, but they tend to be "cookbook" in that they teach specific "recipes" for use in particular situations. These books can be quite valuable as time savers, but not as a

path toward earning to write original code. Think about cookbooks in the original sense. Although great cooks own cookbooks, no one who relies upon cookbooks can be a great cook. A great cook understands ingredients, preparation methods, and cooking methods and knows how they can be combined

to make great meals. All a great cook needs to produce a tasty meal is a fully stocked kitchen. In the same way, a great programmer understands language syntax, application frameworks, algorithms, and software engineering principles and knows how they can be combined to make great programs. Give a great programmer a list of specifications, turn him loose with a fully stocked programming environment, and great things will happen.