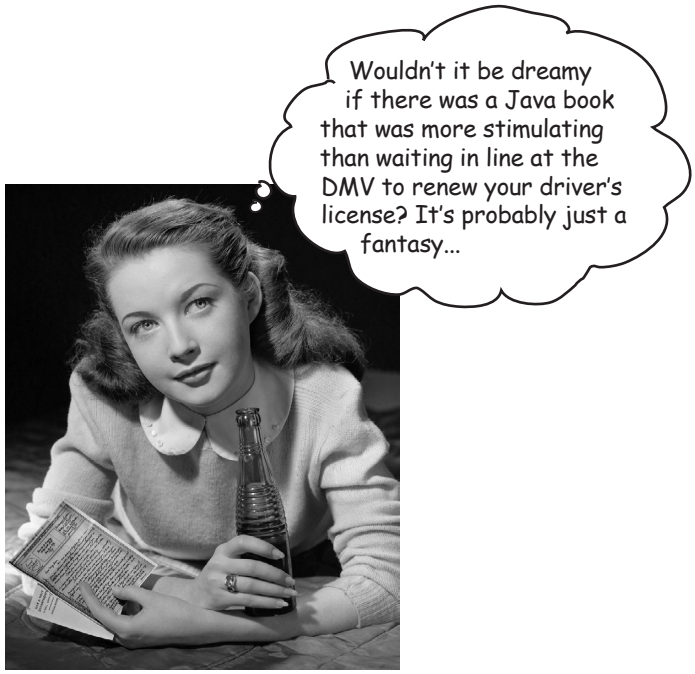
Head First Java™

Third Edition



Kathy Sierra
Bert Bates
Trisha Gee

Beijing • Boston • Farnham • Sebastopol • Tokyo

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Head First Java™

Third Edition

by Kathy Sierra, Bert Bates, and Trisha Gee

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Editor for 1st and 2nd Editions: Mike Loukides

Editors for 3rd Edition: Suzanne McQuade, Nicole Taché

Cover Design: Susan Thompson, based on a series design by Ellie Volckhausen

Cover Illustration: José Marzan, Jr.

Production Editor: Kristen Brown

Original Interior Designers: Kathy Sierra and Bert Bates

3rd Edition Design Support: Ron Bilodeau

Java Whisperer: Trisha Gee

Series Advisors: Eric Freeman, Elizabeth Robson

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(You might want to pick up a copy of *all* the editions...for your kids. Think eBay™)

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Table of Contents (summary)

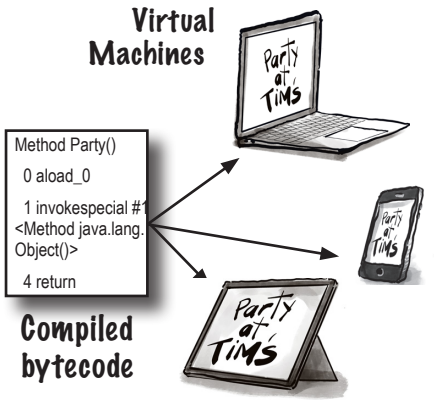
Table of Contents (the real thing)

Intro

Your brain on Java. Here *you* are trying to *learn* something, while here your *brain* is doing you a favor by making sure the learning doesn't *stick*. Your brain's thinking, "Better leave room for more important things, like which wild animals to avoid and whether naked snowboarding is a bad idea." So how *do* you trick your brain into thinking that your life depends on knowing Java?

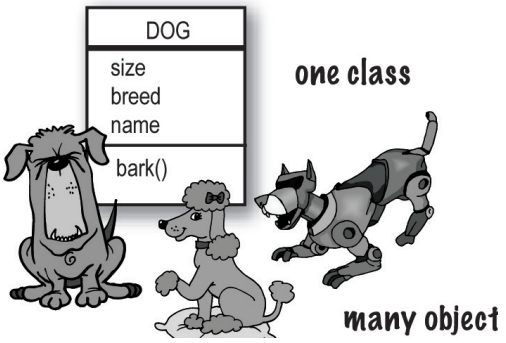
1 Breaking the Surface

Java takes you to new places. From its humble release to the public as the (wimpy) version 1.02, Java seduced programmers with its friendly syntax, object-oriented features, memory management, and best of all—the promise of portability. We'll take a quick dip and write some code, compile it, and run it. We're talking syntax, loops, branching, and what makes Java so cool. Dive in.



2 A Trip to Objectville

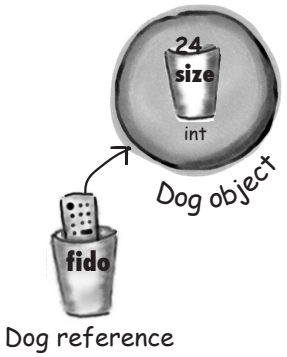
I was told there would be objects. In Chapter 1, we put all of our code in the main() method. That's not exactly object-oriented. So now we've got to leave that procedural world behind and start making some objects of our own. We'll look at what makes object-oriented (OO) development in Java so much fun. We'll look at the difference between a class and an object. We'll look at how objects can improve your life.



3 Know Your Variables

Variables come in two flavors: primitive and reference.

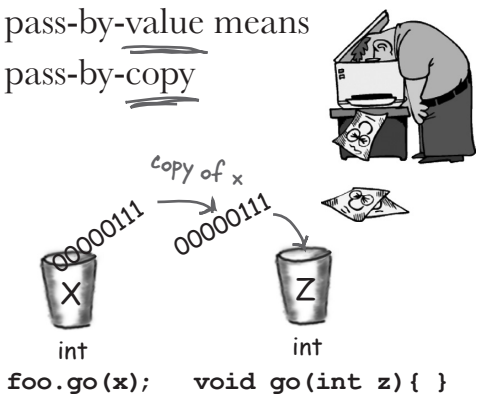
There's gotta be more to life than integers, Strings, and arrays. What if you have a PetOwner object with a Dog instance variable? Or a Car with an Engine? In this chapter we'll unwrap the mysteries of Java types and look at what you can *declare* as a variable, what you can *put* in a variable, and what you can *do* with a variable. And we'll finally see what life is truly like on the garbage-collectible heap.



4 How Objects Behave

State affects behavior, behavior affects state.

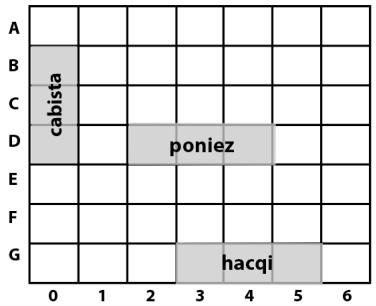
We know that objects have **state** and **behavior**, represented by **instance variables** and **methods**. Now we'll look at how state and behavior are *related*. An object's behavior uses an object's unique state. In other words, ***methods use instance variable values***. Like, "if dog weight is less than 14 pounds, make yippy sound, else..." ***Let's go change some state!***



5 Extra-Strength Methods

Let's put some muscle in our methods. You dabbled with variables, played with a few objects, and wrote a little code. But you need more tools. Like **operators**. And **loops**. Might be useful to **generate random numbers**. And **turn a String into an int**, yeah, that would be cool. And why don't we learn it all by *building* something real, to see what it's like to write (and test) a program from scratch. **Maybe a game**, like Sink a Startup (similar to Battleship).

We're gonna build the Sink a Startup game



6 Using the Java Library

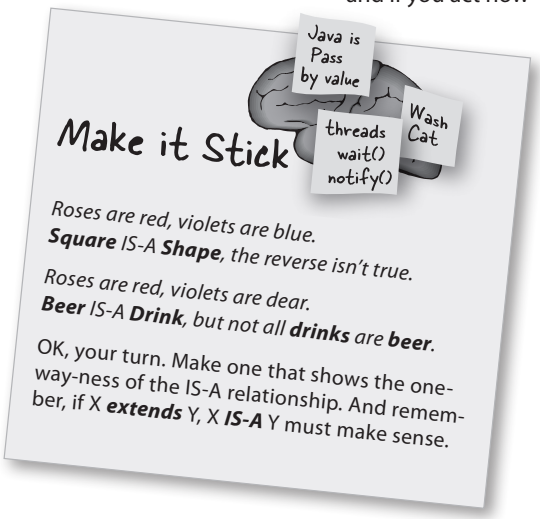
Java ships with hundreds of prebuilt classes. You don't have to reinvent the wheel if you know how to find what you need from the Java library, commonly known as the **Java API**. *You've got better things to do*. If you're going to write code, you might as well write *only* the parts that are custom for your application. The core Java library is a giant pile of classes just waiting for you to use like building blocks.

*"Good to know there's an ArrayList in the java.util package. But by myself, how would **I** have figured that out?"*

- Julia, 31, hand model

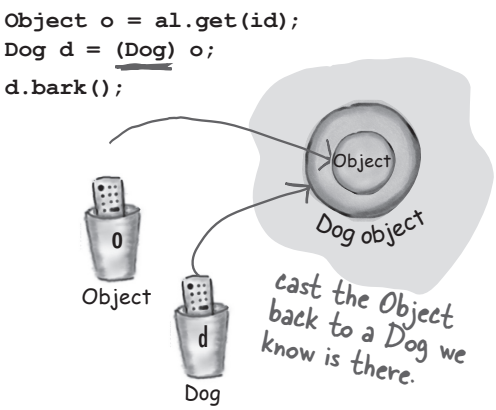
7 Better Living in Objectville

Plan your programs with the future in mind. What if you could write code that someone *else* could extend, **easily**? What if you could write code that was flexible, for those pesky last-minute spec changes? When you get on the Polymorphism Plan, you'll learn the 5 steps to better class design, the 3 tricks to polymorphism, the 8 ways to make flexible code, and if you act now—a bonus lesson on the 4 tips for exploiting inheritance.



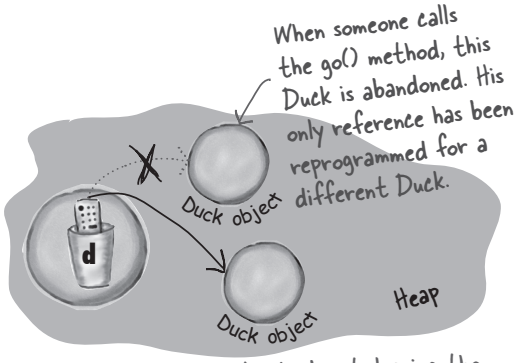
8 Serious Polymorphism

Inheritance is just the beginning. To exploit polymorphism, we need interfaces. We need to go beyond simple inheritance to flexibility you can get only by designing and coding to interfaces. What's an interface? A 100% abstract class. What's an abstract class? A class that can't be instantiated. What's that good for? Read the chapter...



9 Life and Death of an Object

Objects are born and objects die. You're in charge. You decide when and how to *construct* them. You decide when to *abandon* them. The **Garbage Collector (gc)** reclaims the memory. We'll look at how objects are created, where they live, and how to keep or abandon them efficiently. That means we'll talk about the heap, the stack, scope, constructors, super constructors, null references, and gc eligibility.



'd' is assigned a new Duck object, leaving the original (first) Duck object abandoned. That first Duck is toast.

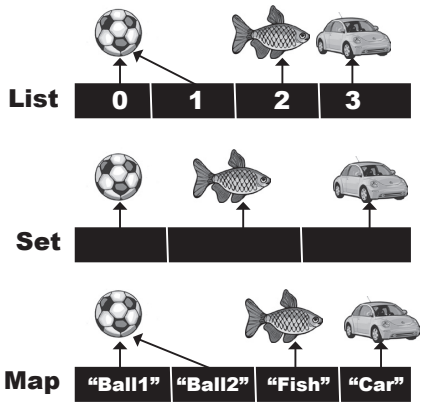
10 Numbers Matter

Do the Math. The Java API has methods for absolute value, rounding, min/max, etc. But what about formatting? You might want numbers to print exactly two decimal points, or with commas in all the right places. And you might want to print and manipulate dates, too. And what about parsing a String into a number? Or turning a number into a String? We'll start by learning what it means for a variable or method to be *static*.

Static variables are shared by all instances of a class.

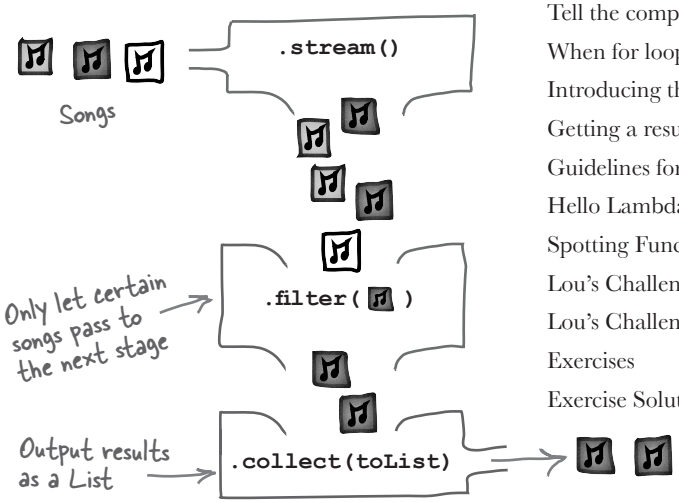
11 Data Structures

Sorting is a snap in Java. You have all the tools for collecting and manipulating your data without having to write your own sort algorithms. The Java Collections Framework has a data structure that should work for virtually anything you'll ever need to do. Want to keep a list that you can easily keep adding to? Want to find something by name? Want to create a list that automatically takes out all the duplicates? Sort your co-workers by the number of times they've stabbed you in the back?



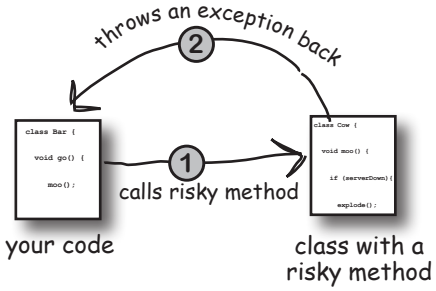
12 Lambdas and Streams: What, Not How

What if...you didn't need to tell the computer HOW to do something? In this chapter we'll look at the Streams API. You'll see how helpful lambda expressions can be when you're using streams, and you'll learn how to use the Streams API to query and transform the data in a collection.



13 Risky Behavior

Stuff happens. The file isn't there. The server is down. No matter how good a programmer you are, you can't control *everything*. When you write a risky method, you need code to handle the bad things that might happen. But how do you *know* when a method is risky? Where do you put the code to *handle* the ***exceptional*** situation? In *this* chapter, we're going to build a MIDI Music Player that uses the risky JavaSound API, so we better find out.



14 A Very Graphic Story

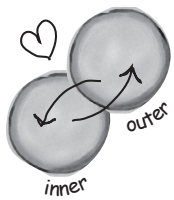
Face it, you need to make GUIs. Even if you believe that for the rest of your life you'll write only server-side code, sooner or later you'll need to write tools, and you'll want a graphical interface. We'll spend two chapters on GUIs and learn more language features including **Event Handling** and **Inner Classes**. We'll put a button on the screen, we'll paint on the screen, we'll display a JPEG image, and we'll even do some animation.

```
class MyOuter  {

    class MyInner {
       void go() {
        }
    }

}
```

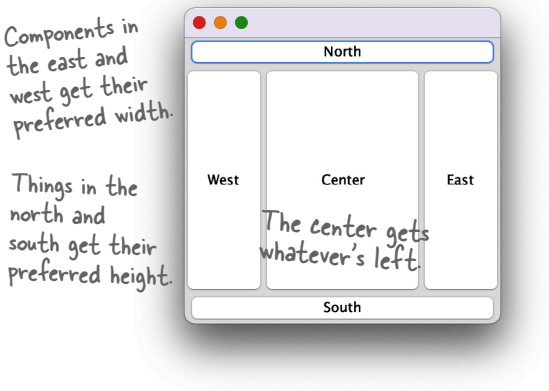
The outer and inner objects are now intimately linked.



These two objects on the heap have a special bond. The inner can use the outer's variables (and vice versa).

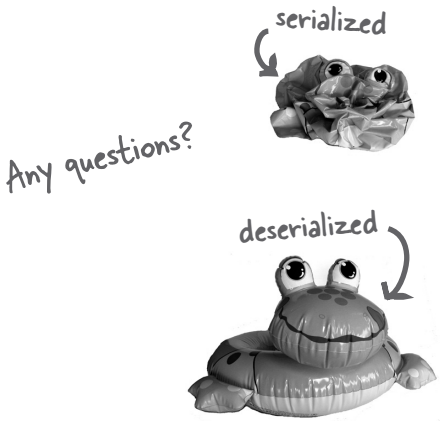
15 Work on Your Swing

Swing is easy. Unless you actually *care* where everything goes. Swing code *looks* easy, but then compile it, run it, look at it, and think, "hey, *that's* not supposed to go *there*." The thing that makes it *easy* to *code* is the thing that makes it *hard* to *control*—the **Layout Manager**. But with a little work, you can get layout managers to submit to your will. In this chapter, we'll work on our Swing and learn more about widgets.



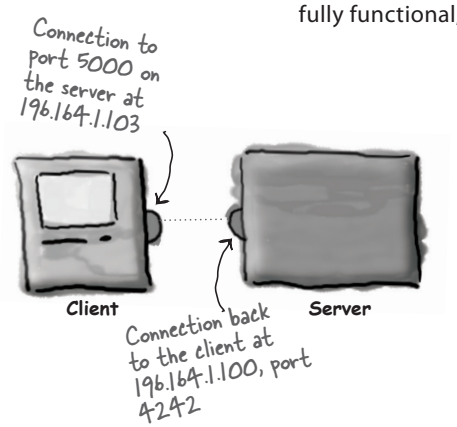
16 Saving Objects (and Text)

Objects can be flattened and inflated. Objects have state and behavior. Behavior lives in the class, but *state* lives within each individual *object*. If your program needs to save state, *you can do it the hard way*, interrogating each object, painstakingly writing the value of each instance variable. Or, **you can do it the easy OO way**—you simply freeze-dry the object (serialize it) and reconstitute (deserialize) it to get it back.



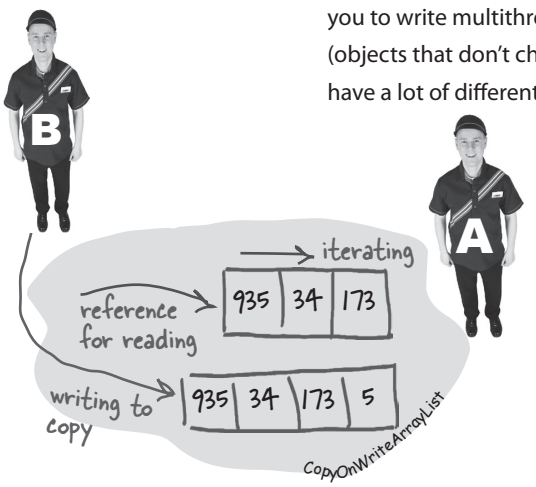
17 Make a Connection

Connect with the outside world. It's easy. All the low-level networking details are taken care of by classes in the java.net library. One of Java's best features is that sending and receiving data over a network is really just I/O with a slightly different connection stream at the end of the chain. In this chapter we'll make client sockets. We'll make server sockets. We'll make clients and servers. Before the chapter's done, you'll have a fully functional, multithreaded chat client. Did we just say *multithreaded*?



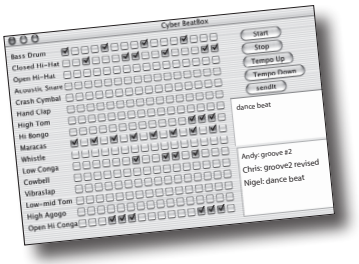
18 Dealing with Concurrency Issues

Doing two or more things at once is hard. Writing multithreaded code is easy. Writing multithreaded code that works the way you expect can be much harder. In this final chapter, we're going to show you some of the things that can go wrong when two or more threads are working at the same time. You'll learn about some of the tools in java.util.concurrent that can help you to write multithreaded code that works correctly. You'll learn how to create immutable objects (objects that don't change) that are safe for multiple threads to use. By the end of the chapter, you'll have a lot of different tools in your toolkit for working with concurrency.



A Appendix A

Final Code Kitchen. All the code for the full client-server chat beat box. Your chance to be a rock star.



B Appendix B

The top ten-ish topics that didn't make it into the rest of the book. We can't send you out into the world just yet. We have a few more things for you, but this *is* the end of the book. And this time we really mean it.

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