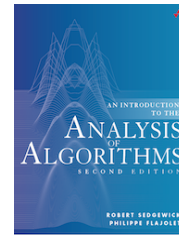
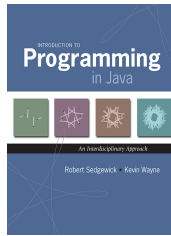




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# Hello World in Java on Mac OS X

This document instructs you on how to set up our Java programming environment for your Mac OS X computer. It also provides a step-by-step guide for creating, compiling, and executing your first Java program using either DrJava or Terminal. All of the software used is freely available. These instructions apply to Mac OS X 10.4.11 (Tiger) to Mac OS X 10.10 (Yosemite).

## 0. Install the Programming Environment

Our installer downloads, installs, and configures the Java programming environment you will be using, including Java SE 6, DrJava, the textbook libraries, and the Terminal.

- Log in to the user account in which you will be programming. Your account must have Administrator privileges (with a non-blank password) and you must be connected to the Internet.
- You will need Apple's Java runtime. It is installed by default on all versions of Mac OS X prior to 10.7. If you are using Mac OS X 10.7 or newer, [install Java for OS X](#).
- To install,

- Download [algs4.zip](#) to the Desktop; double-click it to unzip (if necessary). This creates *algs4.app*.
- If you are running Mac OS X 10.8 or newer, temporarily allow applications downloaded from anywhere by selecting *System Preferences -> Security and Privacy -> General -> Allow applications downloaded from: Anywhere*.
- Double-click *algs4.app* to perform the installation. If you receive a warning that *algs4.app* is an application downloaded from the Internet, click *Open*. If you receive a warning about *algs4.app* being damaged, you probably skipped the previous step.
- Enter your password when prompted.
- If the installation succeeds, you will see the following:
  - A terminal window containing approximately this [execution log](#).
  - A *Standard Draw* window containing a blue bullseye and a textbook graphic.
- Delete *algs4.zip* and *algs4.app*.
- The autoinstaller creates a new folder `/Users/username/algs4`. Do not delete or move this folder (unless your intent is to uninstall everything).
- If you have Mac OS X 10.8 or newer, select *System Preferences -> Security & Privacy -> General -> Allow applications downloaded from: Mac App Store and identified developers* to restore your security settings.

## 1. Create the Program in DrJava

Now you are ready to write your first Java program. You will develop your Java programs in an application called *DrJava*. DrJava features many specialized programming tools including syntax highlighting, bracket matching, auto indenting, and line numbering.

- The installer creates a shortcut to DrJava on the desktop. Double-click it to launch DrJava. If you receive a warning about incoming network connections, click *Allow*.
- In the main DrJava window, type the Java program [HelloWorld.java](#) exactly as it appears below. If you omit even a semicolon, the program won't work.

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello, World");
    }
}
```

As you type, DrJava does the indenting for you.

- Finally, click the *Save* button to save the file. Use DrJava to create the folder `/Users/username/algs4/hello` and name the file `HelloWorld.java`. The file name is case sensitive and must exactly match the name of the class in the Java program.

## 2. Compile the Program from DrJava

It is now time to convert your Java program into a form more amenable for execution on a computer. To do this, click the *Compile* button. If all goes well, you should see the following message in the *Compiler Output* pane at the bottom:

```
Compilation completed.
```

If DrJava complains in some way, you mistyped something. Check your program carefully, using the error messages in the Compiler Output pane as a guide.

## 3. Execute the Program from DrJava

Now it is time to run your program. This is the fun part.

- Type the following in the *Interactions* pane at the bottom. By convention, we highlight the text you type in boldface.

```
> java HelloWorld
```

If all goes well, you should see the following message:

```
Welcome to DrJava. Working directory is /Users/username/algs4/hello
> java HelloWorld
Hello, World
```

- You may need to repeat this *edit-compile-execute* cycle a few times before it works.

## 4. Command-Line Interface

The command-line provides capabilities beyond those available in DrJava, including redirection and piping. You will type commands in an application called the *Terminal*.

- The installer creates a shortcut on the desktop to the Terminal. Double-click it to launch the Terminal. You should see something like:

```
machine:~ username$
```

The ~ is shorthand for your home directory /Users/username; the name machine will be replaced by the name of your machine; the name username will be replaced by your username.

- To confirm that the Java compiler is installed, type the command in boldface below and check that the results match:

```
machine:~ username$ javac -version  
javac 1.6.0_65
```

It's important that you see the number 1.5, 1.6, or 1.7 for the Java version number, but the rest is not critical.

- To confirm that the Java interpreter is installed, type the command in boldface below and check that the results match:

```
machine:~ username$ java -version  
java version "1.6.0_65"  
Java(TM) SE Runtime Environment (build 1.6.0_65-b14-462-11M4609)  
Java HotSpot(TM) 64-Bit Server VM (build 20.65-b04-462, mixed mode)
```

Again, it's important that you see the number 1.5, 1.6, or 1.7 for the Java version number, but the rest is not critical.

## 5. Compile the Program from the Terminal

You will use the `javac` command to convert your Java program into a form more amenable for execution on a computer.

- From the Terminal, navigate to the directory containing `HelloWorld.java`, say /Users/username/intros/hello, by typing the `cd` (*change directory*) commands below:

```
machine:~ username$ cd algs4  
machine:~/algs4 username$ cd hello  
machine:~/algs4/hello username$
```

- Compile it by typing the `javac` command below:

```
machine:~/algs4/hello username$ javac HelloWorld.java
machine:~/algs4/hello username$
```

Assuming the file `HelloWorld.java` is in the current working directory, you should see no error messages.

- If you want to classpath in our standard libraries, use the command `javac-algs4` instead. For example, to compile [TestAlgs4.java](#), which uses our *standard drawing library*, the autoinstaller issues the the following command:

```
machine:~/algs4$ javac-algs4 TestAlgs4.java
```

## 6. Execute the Program from the Terminal

You will use the `java` command to execute your program.

- From the Terminal, type the `java` command below.

```
machine:~/algs4/hello username$ java HelloWorld
Hello, World
```

You should see the output of the program.

- If you want to classpath in our textbook libraries, use the command `java-algs4` instead. For example, to test standard draw and standard audio, type the following two commands:

```
machine:~/algs4/hello username$ java-algs4 edu.princeton.cs.algs4.StdDraw
[ displays a graphics window with some geometric shapes and text ]
```

```
machine:~/algs4/hello username$ java-algs4 edu.princeton.cs.algs4.StdAudio
[ plays an A major scale ]
```

## 7. Checkstyle and Findbugs

You can use [Checkstyle](#) and [Findbugs](#) to check the style of your programs and identify common bugs.

- To run Checkstyle, type the following command in the Terminal:

```
machine:~/algs4/hello username$ checkstyle-algs4 HelloWorld.java
Running checkstyle on HelloWorld.java:
Starting audit...
```

Audit done.

Here is a list of [available checks](#). You can customize the settings by editing the file `/Users/username/algs4/checkstyle-6.1/checkstyle.xml`.

- To run Findbugs, type the following command in the Terminal:

```
machine:~/algs4/hello username$ findbugs-algs4 HelloWorld.class
Running findbugs on HelloWorld.class:
```

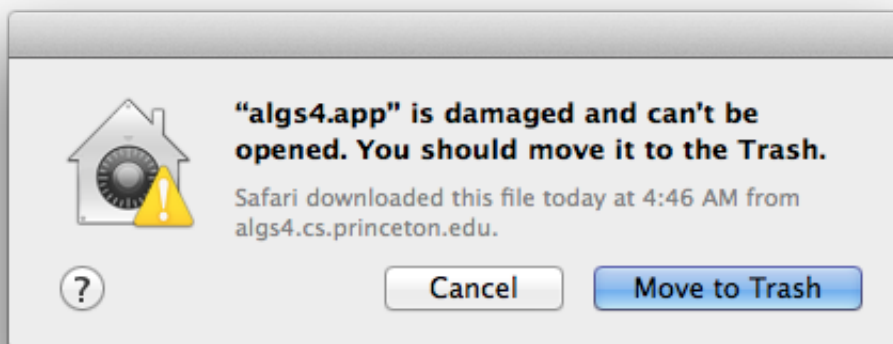
Here is a list of [bug descriptions](#). You can customize the settings by editing the file `/Users/username/algs4/findbugs-2.0.3/findbugs.xml`.

## Troubleshooting

**I previously used the *introcs.app* installer from the textbook *Introduction to Programming in Java*. Should I use the *algs4.app* installer?** Yes, we recommend using the *algs4.app* installer because the *introcs.app* installer does not install the library `algs4.jar` and the corresponding commands `javac-algs4` and `java-algs4`.

**The installer didn't work on my machine. What should I do?** Please read the following three Q+As. If these don't resolve the issue, please contact a staff member to identify what went wrong.

**When I run the installer, I get a dialog telling me that *algs4.app* "is damaged and can't be opened", "is from an unidentified developer", or "OSStatus error -67049."** If you are running Mac OS X 10.8 or newer, be sure to follow the specific instructions for setting the security level in Gatekeeper.



**When I run the installer, I get the error message "bash: /Volumes/Macintosh: No such file or directory".** Your user account and OS must be on the same volume. Also, the directory from which you

run the installer cannot have spaces.

**When I run the installer, the terminal windows just waits after asking for a password. But, I don't even have a password-enabled account.** As indicated in the instructions, you must have a non-blank password. Here are instructions for [resetting a user's password](#).

**What does the installer do?** In short, it downloads, installs, and configures our textbook libraries, Checkstyle, Findbugs, and DrJava. Here is a more detailed list:

1. Checks that Java is installed.
2. Downloads the textbook library from [algs4.jar](#).
3. Downloads the wrapper scripts [javac-algs4](#) and [java-algs4](#).
4. Downloads and installs [Checkstyle 6.1](#) from [checkstyle.zip](#). Downloads our checkstyle configuration file [checkstyle.xml](#) and wrapper script [checkstyle-algs4](#).
5. Downloads and installs [Findbugs 2.0.3](#) from [findbugs.zip](#). Downloads our findbugs configuration file [findbugs.xml](#) and wrapper script [findbugs-algs4](#).
6. Downloads and installs the latest stable version of [DrJava](#), from [drjava-osx.tar.gz](#). Creates a shortcut to DrJava on the desktop. Downloads and installs the DrJava configuration file from [drjava-config.txt](#) to `/Users/username/.drjava`. Note that this will overwrite any existing `.drjava` configuration file.
7. Tests that the installation succeeded by compiling and executing [TestAlgs4.java](#).

**Why does the installer need my password?** The installer copies four files into the `/usr/local/bin` directory, which requires superuser privileges.

**How do I completely uninstall algs4.app?**

- Delete the directory `/Users/username/algs4` (but save any of the `.java` files you created, if desired).
- To uninstall DrJava, delete the following two files:
  - `/Applications/DrJava.app`.
  - `/Users/username/.drjava`.
- To uninstall the Java, Checkstyle, and Findbugs wrapper scripts, delete the following four files:
  - `/usr/local/bin/javac-algs4`
  - `/usr/local/bin/java-algs4`
  - `/usr/local/bin/checkstyle-algs4`
  - `/usr/local/bin/findbugs-algs4`
- Delete the shortcut to DrJava and Terminal on the desktop.



**Do I need to download `algs4.zip` to the Desktop?** No, but some students have reported issues when running `algs4.app` from a folder name that contains whitespace characters. We hope to isolate and fix this bug; in the meantime, please run the installer from the Desktop.

**What happens if I rerun the installer?** It will re-download, install, and configure our textbook libraries, Checkstyle, Findbugs, and DrJava.

**What should I do if I have previously installed DrJava in another location?** We suggest deleting it and using the version in `/Users/username/algs4` by using the newly created shortcut to DrJava on the desktop.

**Why Java 6 instead of Java 7 or Java 8?** Apple provides support for Java 6 but not Java 7 or Java 8. Also, DrJava requires Apple Java 6 to launch.

**Can I use a different version of Java?** Yes, any version of Java 6 or Java 7 should work fine. However, DrJava requires Apple Java 6 to launch (though it will support Java 7 if installed). You may encounter problems with Java 8—for example, findbugs 2.0.3 does not support Java 8.

**Can I use a different IDE?** Yes you can use another IDE (such as Eclipse) but you will have to configure the IDE properties yourself.

**How do I break out of an infinite loop?** From DrJava, click the *Reset* button in the menubar or select the menu option *Tools -> Reset Interactions*; From the Terminal, type `ctrl-c`.

**When using standard input, how do I signify that there is no more data?** If you are entering input from the keyboard, type `ctrl-d` for EOF (end of file) from either DrJava or the Terminal.

**When I compile or execute a program in Terminal that uses one of the textbook libraries, I get an error that it cannot find the library. How can I fix this?** Be sure that you are using the wrapper scripts `/usr/local/bin/javac-algs4` and `/usr/local/bin/java-algs4`.

**Which shell should I use in the Terminal?** Bash is the default shell in Mac OS X, but feel free to use whichever one you prefer.

**I get the error "Unsupported major.minor version 51.0" when I run `checkstyle-algs4`. What could cause this?** That indicates that you have Java 6 but are running a newer version of Checkstyle or Findbugs. Checkstyle 6.9 and Findbugs 3.0 require Java 7 or above.

**I get the error message "Unable to get XClass for java/lang/Class" when I run `findbugs-algs4`. What could cause this?** Findbugs 2.0.3 is incompatible with Java 8. You can use Findbugs 3.0 instead. The autoinstaller uses Findbugs 2.0.3 because Findbugs 3.0 is incompatible with Java 6.

*Last modified on September 03, 2015.*

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