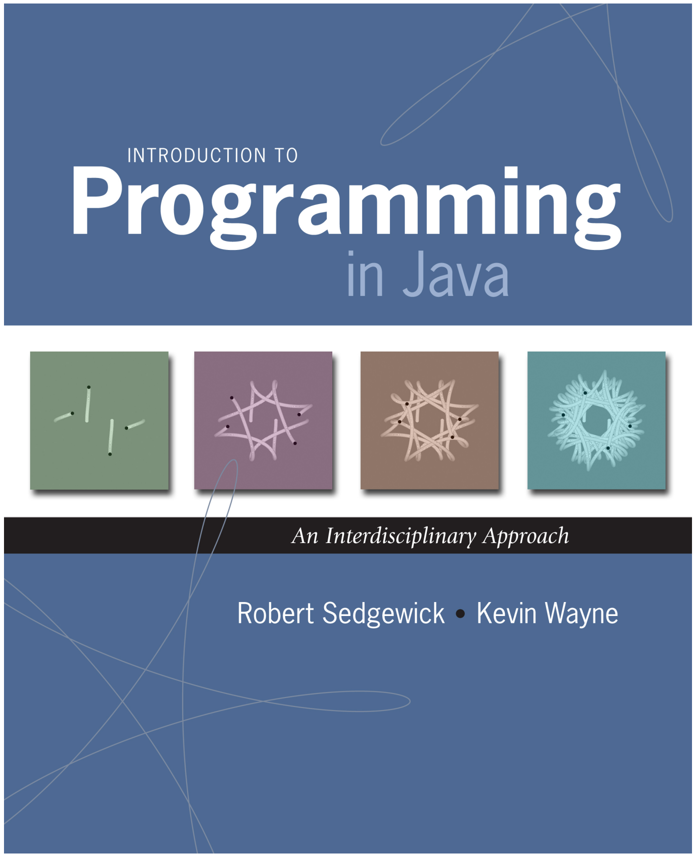
1.1 Your First Program



INTRODUCTION TO

Programming

in Java

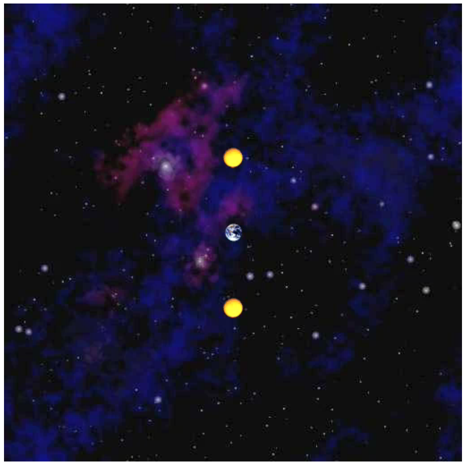
An Interdisciplinary Approach

Robert Sedgewick • Kevin Wayne

Why Programming?

Why programming? Need to tell computer what to do.

"Please simulate the motion of N heavenly bodies, subject to Newton's laws of motion and gravity."

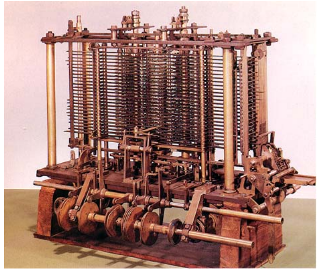


Prepackaged software solutions. Great, they do exactly what you want.

Programming. Enables you to make a computer do anything you want.

well, almost anything
[stay tuned]

Ada Lovelace



Analytic Engine

Languages

Machine languages. Tedious and error-prone.

Natural languages. Ambiguous and hard for computer to parse.

Kids Make Nutritious Snacks.
Red Tape Holds Up New Bridge.
Police Squad Helps Dog Bite Victim.
Local High School Dropouts Cut in Half.

[real newspaper headlines, compiled by Rich Pattis]

High-level programming languages. Acceptable tradeoff.

"Instead of imagining that our main task is to instruct a computer what to do, let us concentrate rather on explaining to human beings what we want a computer to do." – *Donald Knuth*

Why Program?

Why program?

- A natural, satisfying and creative experience.
- Enables accomplishments not otherwise possible.
- Opens new world of intellectual endeavor.

First challenge. Learn a programming language.

Next question. Which one?

The Java Language Specification
The C++ Programming Language
Ruby on Rails
ML
MATLAB
PYTHON Reference Manual
Made with Lisp
Algol 68
MATHEMATICA 5
FORTRAN
THE C PROGRAMMING LANGUAGE
JavaScript
PASCAL
Perl Core Language Little Black Book

Naive ideal. A single programming language.

Our Choice: Java

Java features.

- Widely used.
- Widely available.
- Embraces full set of modern abstractions.
- Variety of automatic checks for mistakes in programs.

Java economy.

$100 billion,
5 million developers

- Mars rover.
- Cell phones.
- Blu-ray Disc.
- Web servers.
- Medical devices.
- Supercomputing.
- …

James Gosling
http://java.net/jag

Why Java?

Java features.

- Widely used.
- Widely available.
- Embraces full set of modern abstractions.
- Variety of automatic checks for mistakes in programs.

Facts of life.

- No perfect language.
- We need to choose some language.

> *" There are only two kinds of programming languages: those people always [gripe] about and those nobody uses."*
>
> *– Bjarne Stroustrup*

Our approach.

- Minimal subset of Java.
- Develop general programming skills that are applicable to many languages.

It's not about the language!

A Rich Subset of the Java Language

Built-In Types	
int	double
long	String
char	boolean

System
System.out.println()
System.out.print()
System.out.printf()

Math Library	
Math.sin()	Math.cos()
Math.log()	Math.exp()
Math.sqrt()	Math.pow()
Math.min()	Math.max()
Math.abs()	Math.PI

Flow Control	
if	else
for	while

Parsing
Integer.parseInt()
Double.parseDouble()

Primitive Numeric Types		
+	-	*
/	%	++
--	>	<
<=	>=	==
!=		

<table>
<tr><th colspan="2">Boolean</th></tr>
<tr><td>true</td><td>false</td></tr>
<tr><td>||</td><td>&&</td></tr>
<tr><td>!</td><td></td></tr>
</table>

Punctuation	
{	}
(	)
,	;

Assignment
=

String	
+	""
length()	compareTo()
charAt()	matches()

Arrays
a[i]
new
a.length

Objects	
class	static
public	private
final	toString()
new	main()

Hello, World

Programming in Java

Programming in Java.

- Create the program by typing it into a text editor, and save it as **`HelloWorld.java`**.

```
/*******************************************
 * Prints "Hello, World"
 * Everyone's first Java program.
 *******************************************/

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

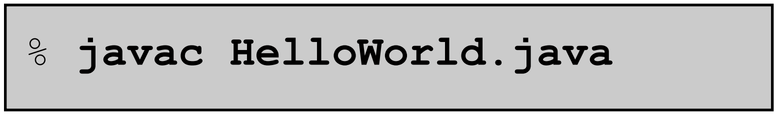
`HelloWorld.java`

Programming in Java

Programming in Java.

- Create the program by typing it into a text editor, and save it as **`HelloWorld.java`**.
- Compile it by typing at the command-line: **`javac HelloWorld.java`**.

command-line →



```
% javac HelloWorld.java
```

(or click the Compile button in DrJava)

- This creates a Java bytecode file named: **`HelloWorld.class`**.

Programming in Java

Programming in Java.

- Create the program by typing it into a text editor, and save it as `HelloWorld.java`.
- Compile it by typing at the command-line:
  `javac HelloWorld.java`.
- **Execute** it by typing at the command-line:
  `java HelloWorld`.

command-line →

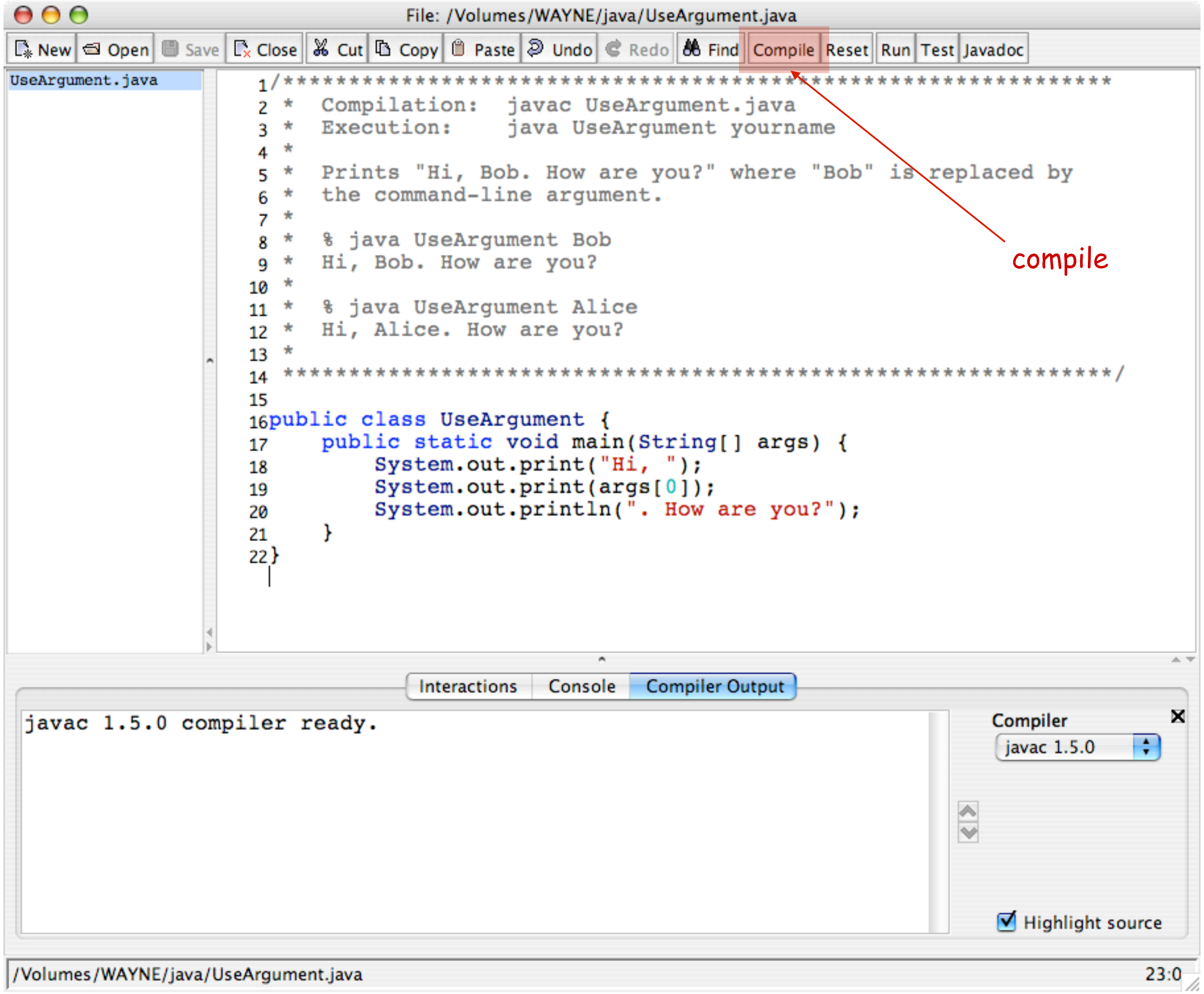
```
% javac HelloWorld.java

% java HelloWorld
Hello, World
```

Dr. Java

`http://drjava.org`

Dr. Java



File: /Volumes/WAYNE/java/UseArgument.java

```
/***************************************************************
 *  Compilation:  javac UseArgument.java
 *  Execution:    java UseArgument yourname
 *
 *  Prints "Hi, Bob. How are you?" where "Bob" is replaced by
 *  the command-line argument.
 *
 *  % java UseArgument Bob
 *  Hi, Bob. How are you?
 *
 *  % java UseArgument Alice
 *  Hi, Alice. How are you?
 *
 ***************************************************************/

public class UseArgument {
    public static void main(String[] args) {
        System.out.print("Hi, ");
        System.out.print(args[0]);
        System.out.println(". How are you?");
    }
}
```

compile

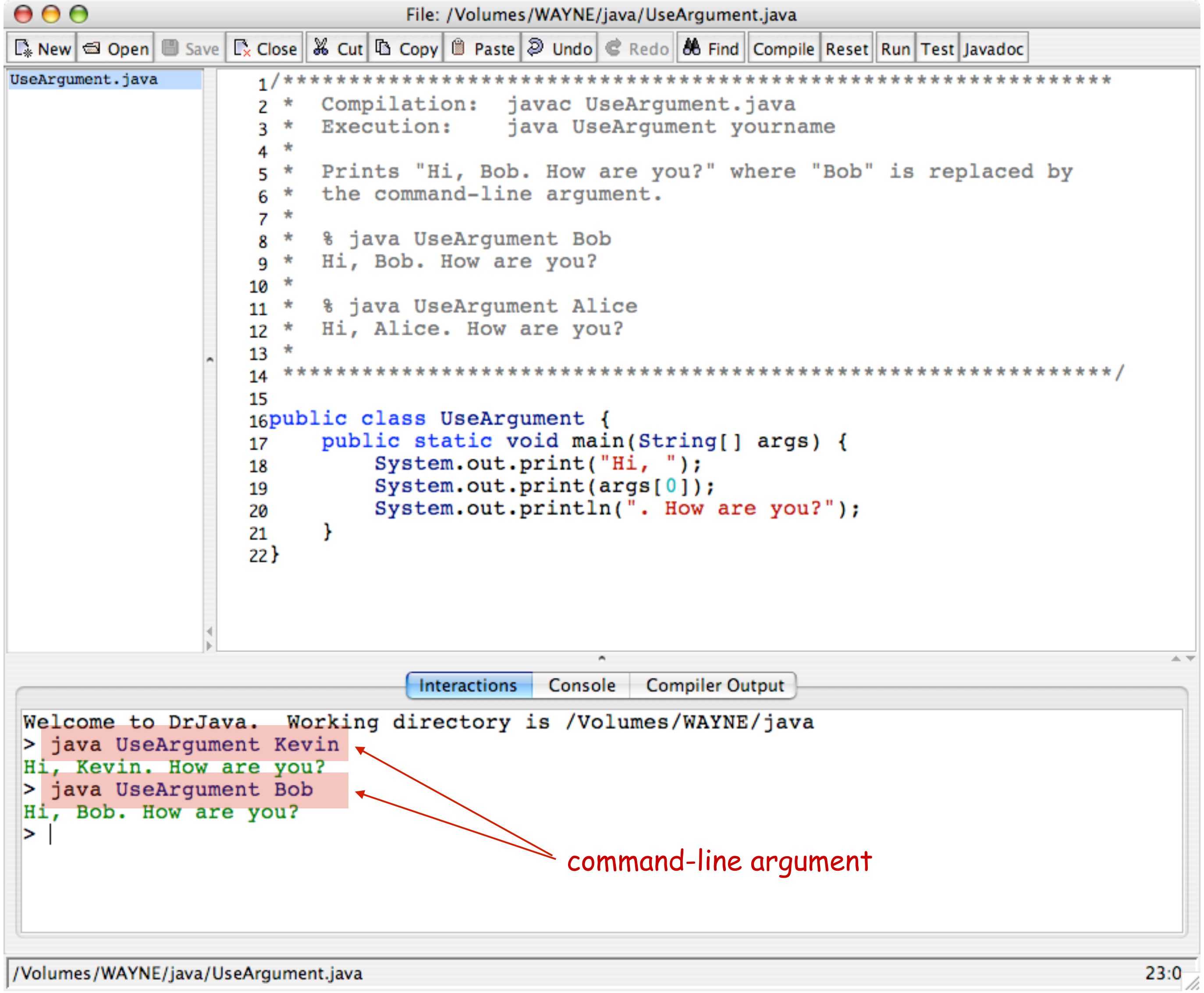
```
javac 1.5.0 compiler ready.
```

Compiler: javac 1.5.0

☑ Highlight source

/Volumes/WAYNE/java/UseArgument.java 23:0

Dr. Java



```
/*************************************************************************
 *  Compilation:  javac UseArgument.java
 *  Execution:    java UseArgument yourname
 *
 *  Prints "Hi, Bob. How are you?" where "Bob" is replaced by
 *  the command-line argument.
 *
 *  % java UseArgument Bob
 *  Hi, Bob. How are you?
 *
 *  % java UseArgument Alice
 *  Hi, Alice. How are you?
 *
 *************************************************************************/

public class UseArgument {
    public static void main(String[] args) {
        System.out.print("Hi, ");
        System.out.print(args[0]);
        System.out.println(". How are you?");
    }
}
```

```
Welcome to DrJava.  Working directory is /Volumes/WAYNE/java
> java UseArgument Kevin
Hi, Kevin. How are you?
> java UseArgument Bob
Hi, Bob. How are you?
> |
```

command-line argument