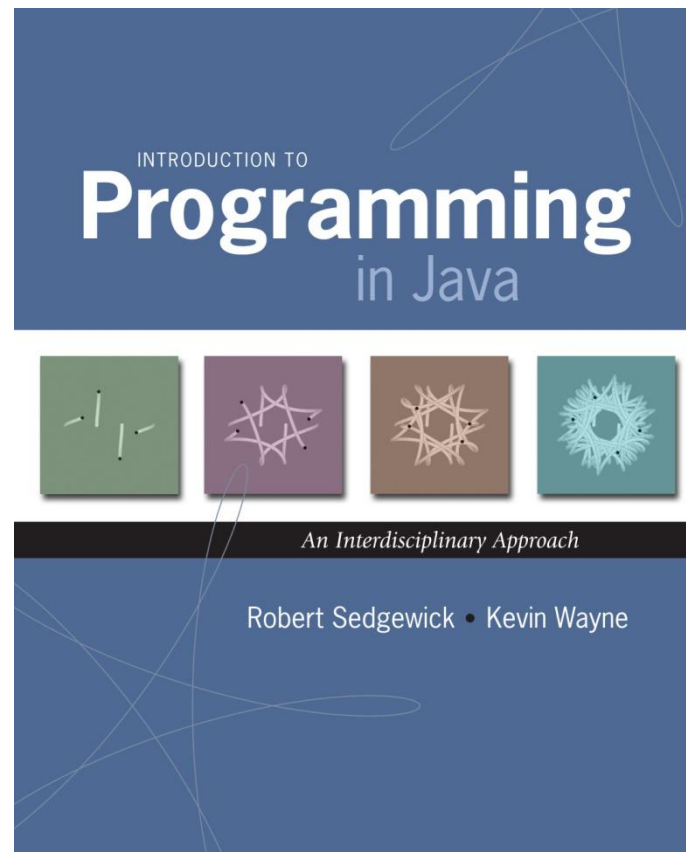


1.1 Your First Program



Why Programming?

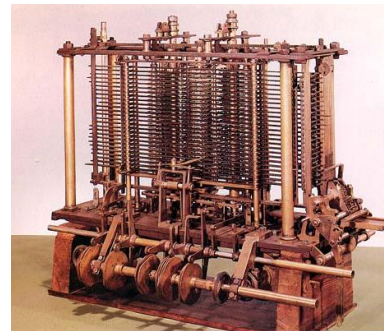
Idealized computer. "Please simulate the motion of a system of N heavenly bodies, subject to Newton's laws of motion and gravity."

Prepackaged software solutions. Great, if it does exactly what you need.

Computer programming. Art of making a computer do what **you** want.



Ada Lovelace



Analytic Engine

Languages

“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

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.

Why Java?

Java features.

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

Java economy.

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

↖
\$100 billion,
5 million developers



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.

Caveat.

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

Why Java?

Java features.

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

Caveat. No perfect language.

Our approach.

- Minimal subset of Java.
- Develop general programming skills that are applicable to:
C, C++, C#, Perl, Python, Ruby, Matlab, Fortran, Fortress, ...

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

+	-	*
/	%	++
--	>	<
<=	>=	==
!=		

Boolean

true	false
	&&
!	

Punctuation

{	}
()
,	;

Assignment

=

String

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

Arrays

a[i]
new
a.length

Objects

class	static
public	private
toString()	equals()
new	main()

Create, Compile, Execute

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 → 

(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:

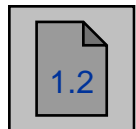
```
java HelloWorld
```

command-line



```
% javac HelloWorld.java  
  
% java HelloWorld  
Hello, World
```

(or click the Run button in DrJava)



Java Bytecode

```
0000000 312 376 272 276 \0 \0 \0 . \0 035 \n \0 006 \0 017 \t
0000020 \0 020 \0 021 \b \0 022 \n \0 023 \0 024 007 \0 025 007
0000040 \0 026 001 \0 006 < i n i t > 001 \0 003 ( )
0000060 v 001 \0 004 C o d e 001 \0 017 L i n e N
0000100 u m b e r T a b l e 001 \0 004 m a i
0000120 n 001 \0 026 ( [ L j a v a / l a n g
0000140 / S t r i n g ; ) v 001 \0 \n S o u
0000160 r c e F i l e 001 \0 017 H e l l o W
0000200 o r l d . j a v a \f \0 007 \0 \b 007 \0
0000220 027 \f \0 030 \0 031 001 \0 \f H e l l o ,
0000240 W o r l d 007 \0 032 \f \0 033 \0 034 001 \0 \n
0000260 H e l l o W o r l d 001 \0 020 j a v
0000300 a / l a n g / O b j e c t 001 \0 020
0000320 j a v a / l a n g / S y s t e m
0000340 001 \0 003 o u t 001 \0 025 L j a v a / i
0000360 o / P r i n t S t r e a m ; 001 \0
0000400 023 j a v a / i o / P r i n t S t
0000420 r e a m 001 \0 007 p r i n t l n 001 \0
0000440 025 ( L j a v a / l a n g / S t r
0000460 i n g ; ) v \0 ! \0 005 \0 006 \0 \0 \0 \0
0000500 \0 002 \0 001 \0 007 \0 \b \0 001 \0 \t \0 \0 \0 035
0000520 \0 001 \0 001 \0 \0 \0 005 * 267 \0 001 261 \0 \0 \0
0000540 001 \0 \n \0 \0 \0 006 \0 001 \0 \0 \0 \f \0 \t \0
0000560 013 \0 \f \0 001 \0 \t \0 \0 \0 % \0 002 \0 001 \0
0000600 \0 \0 \t 262 \0 002 022 003 266 \0 004 261 \0 \0 \0 001
0000620 \0 \n \0 \0 \0 \n \0 002 \0 \0 \0 017 \0 \b \0 020
0000640 \0 001 \0 \r \0 \0 \0 002 \0 016
0000652
```

HelloWorld.class