1.1 Introduction

Welcome to Java—one of the world's most widely used computer programming languages and, according to the TIOBE Index, the world's most popular.1 You're probably familiar with the powerful tasks computers perform. Using this textbook, you'll write instructions in the Java programming language commanding computers to perform those tasks. **Software** (i.e., the instructions you write) controls **hardware** (i.e., computers).

1. http://www.tiobe.com/tiobe-index/

You'll learn *object-oriented programming*—today's key programming methodology. You'll create and work with many *software objects*.

For many organizations, the preferred language for meeting their enterprise programming needs is Java. Java is also widely used for implementing Internet-based applications and software for devices that communicate over a network.

There are billions of personal computers in use and an even larger number of mobile devices with computers at their core. According to Oracle's 2016 JavaOne conference keynote presentation,2 there are now 10 million Java developers worldwide and Java runs on 15 billion devices (Fig. 1.1), including two billion vehicles and 350 million medical devices. In addition, the explosive growth of mobile phones,

tablets and other devices is creating significant opportunities for programming mobile apps.

2. `http://bit.ly/JavaOne2016Keynote`

Devices		
Access control systems	Airplane systems	ATMs
Automobiles	Blu-ray Disc™ players	Building controls
Cable boxes	Copiers	Credit cards
CT scanners	Desktop computers	e-Readers
Game consoles	GPS navigation systems	Home appliances
Home security systems	Internet-of-Things gateways	Light switches
Logic controllers	Lottery systems	Medical devices
Mobile phones	MRIs	Network switches
Optical sensors	Parking meters	Personal computers
Point-of-sale terminals	Printers	Robots
Routers	Servers	Smart cards
Smart meters	Smartpens	Smartphones
Tablets	Televisions	Thermostats
Transportation passes	TV set-top boxes	Vehicle diagnostic systems

Fig. 1.1

Some devices that use Java.

Java Standard Edition

Java has evolved so rapidly that this eleventh edition of Java How to Program—based on **Java Standard Edition 8 (Java SE 8)** and the new **Java Standard Edition 9 (Java SE 9)**—was published just 21 years after the first edition. Java Standard Edition contains the capabilities needed to develop desktop and server applications. The book can be used conveniently with *either* Java SE 8 *or* Java SE 9 (released just after this book was published). For instructors and professionals who want to stay with Java 8 for a while, the Java SE 9 features are discussed in modular, easy-to-include-or-omit sections throughout this book and its Companion Website.

Prior to Java SE 8, Java supported three programming paradigms:

- *procedural programming,*
- *object-oriented programming* and
- *generic programming*.

Java SE 8 added the beginnings of *functional programming with lambdas and streams*. In Chapter 17, we'll show how to use lambdas and streams to write programs faster, more concisely, with fewer bugs and that are easier to *parallelize* (i.e., perform multiple calculations simultaneously) to take

advantage of today's *multi-core* hardware architectures to enhance application performance.

Java Enterprise Edition

Java is used in such a broad spectrum of applications that it has two other editions. The **Java Enterprise Edition (Java EE)** is geared toward developing large-scale, distributed networking applications and web-based applications. In the past, most computer applications ran on "standalone" computers (that is, not networked together). Today's applications can be written with the aim of communicating among the world's computers via the Internet and the web. Later in this book we discuss how to build such web-based applications with Java.

Java Micro Edition

The **Java Micro Edition (Java ME)**—a subset of Java SE—is geared toward developing applications for resource-constrained embedded devices, such as smartwatches, television set-top boxes, smart meters (for monitoring electric energy usage) and more. Many of the devices in Fig. 1.1 use Java ME.