

- 1. Elements of Programming
- 2. Functions
- 3. OOP
- 4. Data Structures

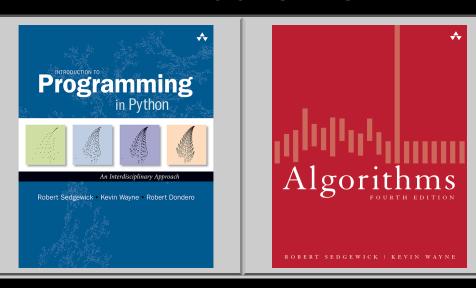
## COMPUTER SCIENCE

- 5. Theory of Computing
- 6. A Computing Machine
- 7. Building a Computer

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- 8. Systems
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# 1. ELEMENTS OF PROGRAMMING

**Overview.** Our goal in this chapter is to convince you that writing a computer program is easier than writing a piece of text such as a paragraph or an essay. In this chapter, we take you through these building blocks, get you started on programming in Java, and study a variety of interesting programs.

- 1.1 Elements of Programming instructs you on how to create, compile, and execute a Java program on your system.
- 1.2 Built-in Types of Data describes Java's built-in data types for manipulating strings, integers, real numbers, and booleans.
- 1.3 Conditionals and Loops introduces Java structures for control flow, including if-else statements, while loops, and for loops.
- 1.4 Arrays considers a data structure known as the array for organizing large quantities of data.
- 1.5 Input and Output extends the set of input and output abstractions (command-line arguments and standard output) to include standard input, standard drawing, and standard audio.
- 1.6 Random Web Surfer presents a case study that models the behavior of a web surfer using a Markov chain.

Java programs in this chapter. Below is a list of Java programs in this chapter. Click on the program name to access the Java code; click on the reference number for a brief description; read the textbook for a full discussion.

1	REF	PROGRAM	DESCRIPTION
	1.1.1	HelloWorld.java 👙	Hello, World
	1.1.2	UseArgument.java 👙	using a command-line argument
	1.2.1	Ruler.java 👙	string concatenation example
	1.2.2	IntOps.java 👙	integer multiplication and division
	1.2.3	Quadratic.java 👙	quadratic formula
	1.2.4	LeapYear.java 🔮	leap year
	1.2.5	RandomInt.java 🔮	casting to get a random integer
	1.3.1	Flip.java 👙	flippling a fair coin
	1.3.2	TenHellos.java 🔮	your first while loop
	1.3.3	PowersOfTwo.java 🔮	computing powers of 2
	1.3.4	DivisorPattern.java 👙	your first nested loops
	1.3.5	HarmonicNumber.java 👙	harmonic numbers
	1.3.6	Sqrt.java 👙	Newton's method
	1.3.7	Binary.java 👙	converting to binary
	1.3.8	Gambler.java 👙	gambler's ruin simulation
	1.3.9	Factors.java 👙	factoring integers
	1.4.1	Sample.java 👙	sampling without replacement
	1.4.2	CouponCollector.java 🔮	coupon collector simulation
	1.4.3	PrimeSieve.java 🔮	sieve of Eratosthenes
	1.4.4	SelfAvoidingWalk.java 👙	self-avoiding random walks
	1.5.1	RandomSeq.java 👙	generating a random sequence
	1.5.2	TwentyQuestions.java 👙	interactive user input
	1.5.3	Average.java 🔮	averaging a stream of numbers
	1.5.4	RangeFilter.java 👙	a simple filter
	1.5.5	PlotFilter.java 👙	standard input-to-drawing filter
	1.5.6	BouncingBall.java 🔮	bouncing ball
	1.5.7	PlayThatTune.java 👙	digital signal processing
	1.6.1	Transition.java 👙	computing the transition matrix
	1.6.2	RandomSurfer.java 👙	simulating a random surfer
	1.6.3	Markov.java 🔮	mixing a Markov chain