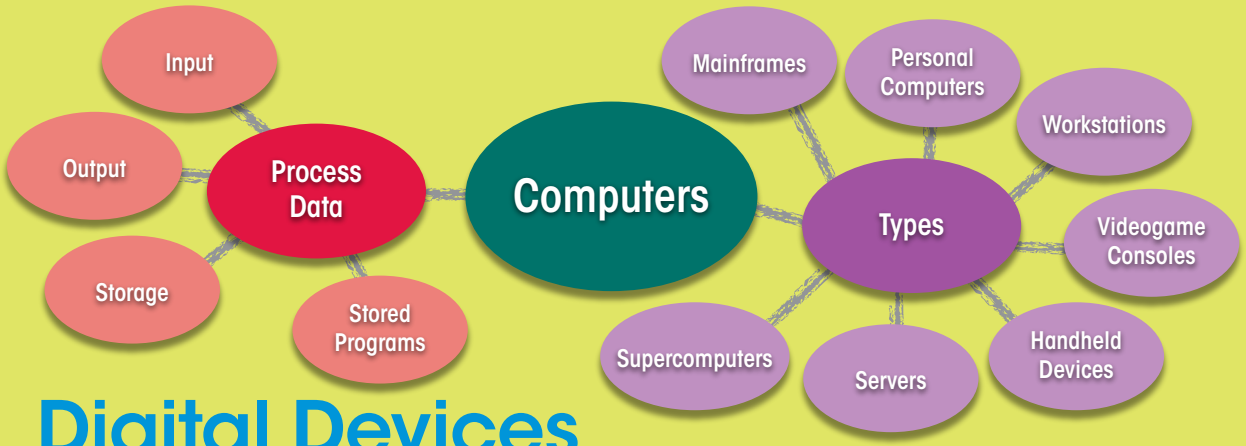

Digital Devices

SECTION B

WHETHER YOU REALIZE IT or not, you already know a lot about the devices produced by the digital revolution. You've picked up information from commercials and news articles, from books and movies, from friends and coworkers—even from using a variety of digital devices and trying to figure out why they don't always work! Section B provides an overview that's designed to help you start organizing what you know about digital devices, beginning with computers.

COMPUTER BASICS

What is a computer? The word *computer* has been part of the English language since 1646; but if you look in a dictionary printed before 1940, you might be surprised to find a computer defined as a person who performs calculations! Prior to 1940, machines designed to perform calculations were usually referred to as calculators and tabulators, not computers. The modern definition and use of the term *computer* emerged in the 1940s, when the first electronic computing devices were developed.

Most people can formulate a mental picture of a computer, but computers do so many things and come in such a variety of shapes and sizes that it might seem difficult to distill their common characteristics into an all-purpose definition. At its core, a **computer** is a multipurpose device that accepts input, processes data, stores data, and produces output, all according to a series of stored instructions (Figure 1-13).

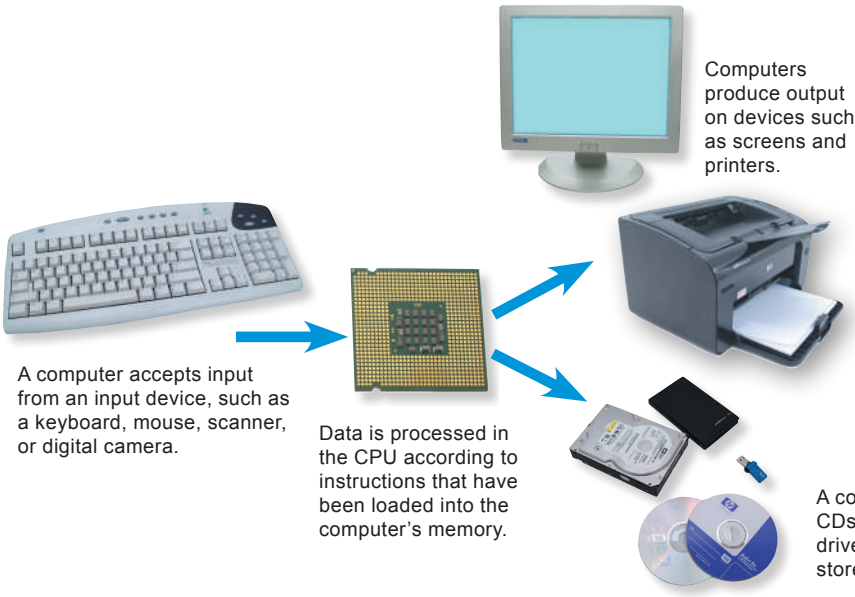

FIGURE 1-13

A computer can be defined by its ability to accept input, process data, store data, and produce output, all according to a set of instructions from a computer program.

What is input? Computer **input** is whatever is typed, submitted, or transmitted to a computer system. Input can be supplied by a person, by the environment, or by another computer. Examples of the kinds of input that computers can accept include words and symbols in a document, numbers for a calculation, pictures, temperatures from a thermostat, audio signals from a microphone, and instructions from a computer program. An input device, such as a keyboard or mouse, gathers data and transforms it into a series of electronic signals for the computer to store and manipulate.

What is output? **Output** is the result produced by a computer. Some examples of computer output include reports, documents, music, graphs, and pictures. Output devices display, print, or transmit the results of processing.

What does *process data* mean? Technically speaking, **data** refers to the symbols that represent facts, objects, and ideas. Computers manipulate data in many ways, and this manipulation is called **processing**. Some of the ways that a computer can process data include performing calculations, modifying documents and pictures, keeping track of your score in a fast-action game, drawing graphs, and sorting lists of words or numbers (Figure 1-14).

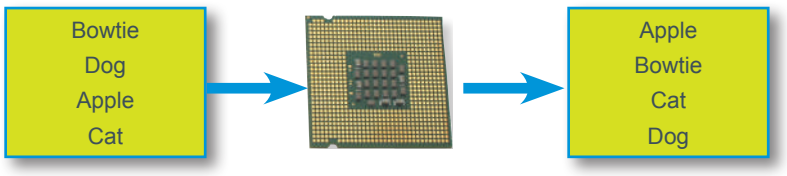

FIGURE 1-14

An unsorted list is input into the computer, where it is processed in the CPU and output as a sorted list.

In a computer, most processing takes place in a component called the **central processing unit** or **CPU**. The CPU of most modern computers is a **microprocessor**, which is an electronic component that can be programmed to perform tasks based on data it receives. You'll learn more about microprocessors later in the chapter. For now, visualize a microprocessor as the little black box that's the brain of a digital device.

How do computers store data? A computer stores data so that it will be available for processing. Most computers have more than one place to put data, depending on how the data is being used. **Memory** is an area of a computer that temporarily holds data waiting to be processed, stored, or output. **Storage** is the area where data can be left on a permanent basis when it is not immediately needed for processing.

Data is typically stored in files. A computer file, usually referred to simply as a **file**, is a named collection of data that exists on a storage medium, such as a hard disk, CD, DVD, or flash drive. A file can contain data for a term paper, Web page, e-mail message, or music video. Some files also contain instructions that tell the computer how to perform various tasks.

What's so significant about a computer's ability to store instructions? The series of instructions that tells a computer how to carry out processing tasks is referred to as a **computer program**, or simply a program. These programs form the **software** that sets up a computer to do a specific task. When a computer "runs" software, it performs the instructions to carry out a task.

Take a moment to think about the way you use a simple handheld calculator to balance your checkbook each month. You're forced to do the calculations in stages. Although you can store data from one stage and use it in the next stage, you cannot store the sequence of formulas—the program—required to balance your checkbook. Every month, therefore, you have to

TRY IT!

Suppose you see an iPad advertised with a 64-GB capacity. Does that specification refer to memory or storage?

❍ memory

❍ storage

perform a similar set of calculations. The process would be much simpler if your calculator remembered the sequence of calculations and just asked you for this month's checkbook entries.

The idea of a **stored program** means that a series of instructions for a computing task can be loaded into a computer's memory. These instructions can easily be replaced by a different set of instructions when it is time for the computer to perform another task. This ability to switch programs makes computers multipurpose machines.

The stored program concept allows you to use your computer for one task, such as word processing, and then easily switch to a different type of computing task, such as editing a photo or sending an e-mail message. It is the single most important characteristic that distinguishes a computer from other simpler and less versatile digital devices, such as watches, calculators, and pocket-sized electronic dictionaries.

TRY IT!

Do you know the difference between the apps you use and your computer's operating system? Which of the following are operating systems?

- ❍ Microsoft Windows
- ❍ Microsoft Word
- ❍ Apple iOS
- ❍ Mac OS X
- ❍ iWork
- ❍ iTunes

What kinds of software do computers run? Computers run two main types of software: application software and system software. A computer can be applied to many tasks, such as writing, number crunching, video editing, and online shopping. **Application software** is a set of computer programs that helps a person carry out a task. Word processing software, for example, helps people create, edit, and print documents. Personal finance software helps people keep track of their money and investments. Video editing software helps people create home movies and professional films. Software applications are sometimes referred to as **apps**, especially in the context of handheld devices.

Whereas application software is designed to help a person carry out a task, the primary purpose of **system software** is to help the computer system monitor itself in order to function efficiently. An example of system software is a computer **operating system** (OS), which is essentially the master controller for all the activities that take place within a computer. Although an operating system does not directly help people perform application-specific tasks, such as word processing, people do interact with the operating system for certain operational and storage tasks, such as starting programs and locating data files.

COMPUTER TYPES AND USES

Are computers categorized in any way? At one time it was possible to define three distinct categories of computers. Mainframes were housed in large, closet-sized metal frames. Minicomputers were smaller, less expensive, and less powerful computers that were able, nevertheless, to support multiple users and run business software. Microcomputers were clearly differentiated from computers in other categories because they were dedicated to a single user and their CPUs consisted of a single microprocessor chip.

Today, microprocessors are no longer a distinction between computer categories because just about every computer uses one or more microprocessors as its CPU. The term *minicomputer* has fallen into disuse, and the terms *microcomputer* and *mainframe* are used with less and less frequency.

Computers are versatile machines, but some computers are better suited than others for certain tasks. Categorizing computers is a way of grouping them according to criteria such as usage, cost, size, and capability. Experts don't necessarily agree on the categories or the devices placed in each category, but commonly used computer categories include personal computers, servers, mainframes, and supercomputers.

TERMINOLOGY NOTE

The term *personal computer* is sometimes abbreviated as *PC*. However, *PC* can also refer to a specific type of personal computer that descended from the original IBM PC and runs Windows software.

In this book, *PC* refers to IBM PC descendants. It is not used as an abbreviation for *personal computer*.