OBJECTIVES
At the end of this chapter you will be able to:

1. Define Computer and Identify the Four Basic Computing Functions
2. Identify the Different Types of Computers
3. Describe Hardware Devices and Their Uses
4. Identify Types of Software and Their Uses
5. Describe Networks and Define Network Terms
6. Identify Safe Computing Practices
Introduction

Computers are an integral part of our lives. They are found in homes, offices, stores, hospitals, libraries, and many other places. Computers are part of cars and phones, and they enable you to access bank accounts from home, shop online, and quickly communicate with people around the world by means of e-mail and the Internet. It is difficult to find a business or occupation that doesn’t rely on computers. Whether it’s a truck driver who keeps an electronic travel log or a high-powered stockbroker who needs up-to-the-second market information, computers make these tasks easier, more efficient, and more accurate.

Computers are all around us, which makes it important to learn basic computing skills and gain the knowledge to be a responsible computer user. Knowing how to use a computer makes you computer fluent.

This chapter looks at different types of computers and their functions. It discusses computer hardware and software and the benefits of networking. In addition, this chapter also discusses the importance of safe computing practices and the ways that you can protect your computer from various threats.
Objective 1
Define Computer and Identify the Four Basic Computing Functions

What are the benefits of using computers? Becoming computer fluent can benefit you in several ways. The most practical advantage of being computer fluent is that it makes employees more attractive to potential employers. In fact, many employers expect employees to have basic computer skills when they are hired. If you are knowledgeable about computers and their uses, it also makes you a better consumer. It is easier to select and purchase the right computer for your needs if you understand computer terminology and the components of a computer. In addition, if you have a basic understanding of today’s technology, you can better understand and use new technologies.

What are the basic functions of a computer? A computer is a programmable electronic device that can input, process, output, and store data. A computer takes data and converts it into information. Many people use the words data and information interchangeably; however, they are different in computing and it is important to understand the distinction. Each piece of data entered into a computer represents a single fact or idea. Data can be a word, a number, a sound, or a picture.

Information is data that has been processed so that it can be presented in an organized and meaningful way. You might also think of data as pieces of a jigsaw puzzle and information as the finished puzzle. Putting the pieces of the puzzle together gives you the overall picture. For example, CIS 110, the letter B, and the names Amy and Stevens are pieces of data. Individually, these pieces of data seem meaningless. However, when processed, this data becomes the information on a grade report that indicates Amy Stevens received a grade of B in her CIS 110 class.

The four basic computer functions are also known as the information processing cycle. The functions are

- **Input**—The computer gathers data or allows a user to add data.
- **Process**—Data is converted into information.
- **Output**—The processed results are retrieved from the computer.
- **Storage**—Data or information is stored for future use.

In the grade report, the instructor used a computer to enter, or input, the students’ grades into the school’s computerized grading system. A computer then processed this data along with data for other classes the students might have taken. In the example, the student, Amy, then received a written record of her grade or she accessed it online. Either way, the grade report was output by the computer. In addition, her grades remain stored in the system so they can be used to generate her transcript or to determine her future grade point average as she continues to take classes.
Objective 2
Identify the Different Types of Computers

What are the different types of computers and what are they used for? Although computers come in a variety of sizes and shapes, the basic components required to complete the information-processing cycle must be present in them. In addition to microcomputers—the desktop and notebook computers and mobile devices that many of us are familiar with—there are also specialty computers, including servers, mainframes, supercomputers, and embedded computers.

Microcomputers

What are microcomputers? Microcomputers are classified as small, inexpensive computers designed for personal use and are the computers that most people typically use. Computers in this category range in size from large desktop systems to handheld devices that fit in your pocket. Some of the most common types of microcomputers include the following:

- **Desktop computers** are computers that sit on the desk, floor, table, or another flat surface and have a detachable keyboard, mouse, monitor, and possibly other pieces of equipment.

  Desktop computers generally fall into two main categories: PCs or Macs. The PC, or personal computer—originally referred to as the IBM personal computer—is now manufactured by a variety of companies including Hewlett-Packard, Dell, and Gateway. The Apple Macintosh computer, now known as Mac, can perform the same functions as the PC.

  Computer users have been in a long-running argument about which is better—PC or Mac? There are pros and cons to both types of computers, but in reality, both are good systems and the choice usually comes down to personal preference. The primary differences between the PC and the Mac relate to the different microprocessors and operating systems each one uses. The PC is typically used in a Microsoft Windows operating environment, and the Mac uses the Mac operating system. Although the PC and the Mac each process information differently, both can perform the same types of tasks. The PC has a larger market share among general computer users and in business settings, whereas the Mac is popular with graphic design professionals.

- **Notebook computers** give users the ability to take their computers with them, making their information portable or mobile. Originally referred to as “laptops,” this term is slowly being phased out in favor of the more accurate notebook designation. Although smaller than a desktop computer, notebook computers are not meant to be used on your lap, due to the amount of heat they generate. Notebooks are designed to be portable and include a rechargeable battery to provide power, permitting them to be used in a variety of places. Averaging about 6 pounds, a notebook’s size and weight can also limit its computing power. Notebooks typically have a built-in display screen, a keyboard, and a pointing device, although it is possible to connect them to detachable devices for more comfortable desktop use.
• **Tablet computers** might seem similar to notebooks; however, they have some special features that set them apart. Tablet computers weigh less than notebooks, averaging about 3 pounds. They also have a convertible screen that swivels, allowing the tablet to be used like a standard notebook computer in one position or like a clipboard in the second position. This “clipboard” aspect is how the tablet got its name. When used in the tablet configuration, the user can actually write directly on the screen using a special pen known as a **stylus**. Tablets use advanced handwriting-recognition technology to convert handwriting to digital text. Many also use speech-recognition technology, which enables the user to record discussions or lectures, for example, or to control the computer using voice commands.

• **Mobile devices** include items such as **personal digital assistants (PDAs)**, **handheld computers**, and **smartphones**. These devices originally varied in size and purpose, but they are all ultra-lightweight and portable. PDAs were initially designed to provide a convenient resource for maintaining an organized calendar and list of business and personal associates. Handheld computers enabled users to access personal productivity software and send e-mail over the Internet, while smartphones added Internet capability to the wireless communication aspects of cell phones.

The newest mobile devices, often referred to simply as “handhelds,” combine the best features of each of these devices. Many handheld devices now include personal productivity software and enable the user to play music, take photos, make phone calls, and access the Internet. PDAs and handheld computers often use a stylus, which is a pointed device used to input information and access various features. However, it is not uncommon for these devices to use a small detachable keyboard for text and data entry. As the features of mobile devices continue to converge, permitting them to perform similar tasks, it becomes more difficult to differentiate between these handheld devices. Figure 1.1 identifies four different types of microcomputers.
Servers

What are servers? Servers are an important component of computer networks. These specialized computers manage network resources through the use of administrative software, and they provide desktop computers with access to the network. Servers can handle a variety of resources or may be assigned to just one particular type of task. Thus, within the same company, you may find a Web server that processes requests for the organization’s Web pages and a file server that handles the storage and retrieval tasks for all of the company’s files stored on the network.

Mainframe Computers

What are mainframe computers? Mainframe computers are large computers often found in businesses and colleges, where thousands of people are able to simultaneously use the computer to process data. Mainframe computers multitask; that is, they can perform more than one task at a time. Mainframes can store vast amounts of data using a variety of storage devices. Early mainframe computers were very large and required separate rooms to house them. Today’s mainframe computers are significantly smaller.

Supercomputers

What are supercomputers? Supercomputers are large, powerful computers that perform specialized tasks. You might have heard of Deep Blue, the IBM supercomputer that challenged champion chess players to chess matches—and beat them! Supercomputers are the fastest and most expensive computers. Unlike a mainframe computer that can handle a number of programs simultaneously, the supercomputer is designed to run fewer programs at one time, but to do so as quickly as possible. They perform sophisticated mathematical calculations, track weather patterns, monitor satellites, and perform other complex, dedicated tasks.

Embedded Computers

What are embedded computers? Embedded computers are components of larger products that usually have a digital interface. These computers use a specially programmed microprocessor to perform a set of predefined tasks, and may require little or no input from the user. Microwave ovens, digital cameras, programmable thermostats, and airbags and antilock braking systems for cars are just a few examples of products that use embedded computers.

Objective 3
Describe Hardware Devices and Their Uses

What is computer hardware? Hardware is the computer and any equipment connected to it. Hardware devices are the physical components of the computer. Items such as the monitor, keyboard, mouse, and printer are also known as peripherals because they attach to the computer.

The computer itself is known as the system unit, and it contains many of the critical hardware and electrical components. The system unit is
sometimes referred to as the tower, box, or console. When the system unit is combined with the appropriate peripheral devices, the system can perform the four basic computer functions: input, process, output, and storage. Peripheral devices are used to input and output data and information, and the system unit processes and stores the data. Figure 1.2 shows a standard computer system and identifies the function each piece of hardware performs.

**Figure 1.2**

![System Unit Diagram](image)

**System Unit**

*What is inside the system unit?* If you remove the cover from the system unit, you find several key components inside. One of the most essential components is the *microprocessor chip*, also known as the *central processing unit (CPU)*. The CPU is located on the *motherboard*, a large printed circuit board to which all the other circuit boards in the computer are connected. Figure 1.3 displays a standard motherboard and identifies its components. The table in Figure 1.4 identifies and explains each of the components.

**Figure 1.3**

![Motherboard Diagram](image)
What does the CPU do? The CPU is the brain of the computer, and is responsible for controlling the commands and tasks that the computer performs. It has two main parts—the control unit and the arithmetic logic unit (ALU). The control unit is responsible for obtaining instructions from the computer’s memory. It then interprets these instructions and executes them, thereby coordinating the activities of all the other computer components. The arithmetic logic unit, or ALU, performs all the arithmetic and logical functions for the computer. The ALU handles addition, subtraction, multiplication, and division, and also makes logical and comparison decisions. This enables the CPU to perform tasks such as sorting data alphabetically or numerically and filtering data to locate specific criteria.

As important as the CPU is to your computer, you might expect it to take up a large amount of space in the console. However, the CPU is actually rather small. Over the years, manufacturers have successfully attempted to reduce the size of microprocessor chips while continuing to increase their computing power. In fact, Moore’s law (formulated in 1965 by Gordon Moore, cofounder of Intel) addresses this increase in computing power, observing that current production methods allow CPU capacity to double every 18 months!

Are there different brands of CPUs? The most well-known chip manufacturers include Intel, Advanced Micro Devices (AMD), and Motorola. Chip manufacturers often produce several different models of chips. Some of the chips that Intel makes include Core Duo, Pentium, Celeron, and Centrino. AMD manufactures chips such as the Athlon, Sempron, and Turion. Intel and AMD chips are the mainstays for PCs. For many years, Apple relied on Motorola to provide the PowerPC processor, the only CPUs the Macintosh used. However, in 2006, Apple stopped producing PowerPC-based systems and began using Intel chips, such as the Core Duo, in its computers.
How is a CPU's processing power measured? One indicator of a CPU’s processing power is its clock speed. Clock speed measures the speed at which a CPU processes data and is measured in megahertz (MHz) or gigahertz (GHz), depending on the age of the CPU. Early computers had CPUs that processed at speeds of less than 5 MHz, whereas modern processors can operate at over 3 GHz (the equivalent of 3,000 MHz) and newer processors continue to surpass these numbers.

Are there other factors that affect a CPU's processing power? CPUs may use different technologies to enhance their processing performance. Some Intel chips use hyperthreading technology, which enables the microprocessor to act as if it were two processors, resulting in faster processing and improved processing power. Dual-core or multicore processors are manufactured by Intel and AMD. These CPUs have more than one processor (two for a dual-core, more for a multicore) on a single chip. Using multiple processors has several advantages over a single processor CPU, including improved multitasking capabilities and system performance, lower power consumption, reduced usage of system resources, and lower heat emissions.

What types of memory does a computer have and what are they used for? Memory is another critical computer component found within the system unit. There are two basic types of memory: ROM and RAM. ROM, or Read Only Memory, is prerecorded on a chip. As the name implies, the computer can read this memory, although that’s all it can do. The information on a ROM chip can’t be changed, removed, or rewritten and is generally inaccessible to the computer user. ROM is also known as nonvolatile memory because it retains its contents even if the computer is turned off. ROM is used to store critical information, such as the program used to start up, or boot, the computer.

The second type of memory is RAM, which stands for Random Access Memory. RAM acts as the computer’s short-term memory and stores data temporarily as it is being processed. RAM is considered to be volatile because this memory is erased when the computer is turned off. The more tasks your computer performs at the same time, the more memory is used.

Why is it important to have enough RAM? Your computer’s RAM is like the juggler for your system. When you first start your computer, it’s as if a juggler is tossing bean bags. As you open more programs, or use a memory-intensive program such as a video editor, the level of difficulty for the juggler increases. Soon RAM is trying to juggle the equivalent of bowling balls! If you don’t have a sufficient amount of memory in your system, you might notice your computer slows down or even stops responding if you try to do too much at one time. Computer users often think this means they have too much information saved on their computer’s hard drive. It really means that they are running out of memory, not storage space. To fix this problem, you can reduce the number of programs running at the same time or you can add more RAM to your system.

Installing new memory is one of the cheapest and easiest upgrades you can do for your computer and often results in noticeable performance improvements.
improvements. RAM is usually measured in **megabytes (MB)** or **gigabytes (GB)**. For newer systems, a minimum of 512 MB to 1 GB is recommended. If you are thinking of purchasing a new computer, experts recommend you buy one with as much RAM as possible.

### Storage Devices

**What are storage devices?** Storage devices are used to store the data and information used by or created with the computer. Such storage is often referred to as **permanent memory** because, unlike data that is in RAM, data saved to a storage device remains there until the user deletes or overwrites it. Data can be stored within internal hardware devices located within the system unit or in removable external units. Additionally, storage can be fixed or portable, depending on whether the data saved remains within the system unit or is saved on removable units and accessed elsewhere.

**How is data stored?** Before discussing specific storage devices, it is helpful to understand the different technologies used to store data. Data is generally saved using one of three forms of storage medium: magnetic, optical, or flash memory.

- **Magnetic** storage uses tape or film covered in a thin, magnetic coating that enables data to be saved as magnetic particles. It works in much the same fashion as an audiocassette or videotape works. Hard disks, floppy disks, Zip disks, and backup tape are all forms of magnetic media. Magnetic disks are divided into **tracks** and **sectors**. Just like an old vinyl record, tracks form rings around the circumference of the media. Sectors divide the tracks into pie-shaped wedges extending from the center to the outer edge of the disk. Data is stored magnetically within the sectors. Magnetic media has read/write capability, which means it is possible to use it over and over again, enabling you to delete or revise existing data and save new data.

- **Optical** storage uses flat plastic discs coated in a special reflective material. Data is saved by using a laser beam to burn tiny pits into the storage medium. The laser is also used to read the saved data. The saved data is organized using tracks and sectors, similar to those used in magnetic media. Compact discs (CDs) and digital video discs (DVDs) are examples of optical media. Unlike magnetic media, not all optical storage is read/write capable. CD-ROMs and DVD-ROMs are considered read-only media (ROM); the information contained on them can be read, but not changed or deleted, and it is not possible to save new data to them. If you purchase new software, music, or a movie, it is most likely on a CD-ROM or DVD-ROM. A record-only disc, or CD-R, allows you to record, or **burn**, information to the disc one time only: information saved this way cannot be deleted or rewritten. A rewritable disc, known as a CD-RW, allows information to be recorded, revised, or deleted, and new data can also be written to the disc, just as with magnetic media. The same possibilities are available in DVDs. However, there are currently two competing formats—DVD-R/RW, known as “DVD dash,” and DVD+R/RW, known as “DVD plus.” The R/RW suffix indicates the DVD can be used to record and can also be rewritten. Although most DVD players can play either format, if you
want to record to a DVD, you need to know which format the DVD recorder requires.

- **Flash memory** uses solid-state technology. It is completely electronic and has no moving mechanical parts. Flash memory is a quick and easy form of rewritable storage, capable of exceeding the storage capacity of magnetic or optical media. Flash memory cards are often used in mobile devices such as PDAs, digital cameras, and MP3 players. Depending on the manufacturer, flash memory cards may be called Memory Stick, CompactFlash, Secure Digital, or MultiMediaCard. Typically, a device can use only one style of memory card; however, a computer equipped with the appropriate card reader can read any of them. Small, removable storage devices known as flash drives also use flash technology and have become increasingly popular.

The table in Figure 1.5 lists the various types of storage media and their capacities.

<table>
<thead>
<tr>
<th>STORAGE MEDIUM</th>
<th>CAPABILITIES</th>
<th>STORAGE CAPACITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard Drive</td>
<td>Read and write</td>
<td>External: Up to 2 TB (Terabyte) Internal: Up to 500 GB</td>
</tr>
<tr>
<td>CD</td>
<td>Read-only</td>
<td>700 MB</td>
</tr>
<tr>
<td>CD-RW</td>
<td>Read and write</td>
<td></td>
</tr>
<tr>
<td>DVD</td>
<td>Read-only</td>
<td>4.7 GB (for single-sided, single-layered DVDs)</td>
</tr>
<tr>
<td>DVD+RW</td>
<td>Read and write</td>
<td>9.4 GB (for single-sided, double-layered DVDs)</td>
</tr>
<tr>
<td>Flash Memory Cards</td>
<td>Read and write</td>
<td>16 MB to 8 GB</td>
</tr>
<tr>
<td>Floppy Disk</td>
<td>Read and write</td>
<td>1.44 MB</td>
</tr>
<tr>
<td>Flash Drive</td>
<td>Read and write</td>
<td>Up to 6 GB</td>
</tr>
</tbody>
</table>

**What are the main types of storage devices?** Depending on the age and type of computer you have, you might find some or all of the following internal storage options:

- **Hard disk drive**—A hard disk drive is the computer’s largest internal storage device. Also referred to as a hard drive, its storage space is usually measured in gigabytes (GB), with newer computers ranging in size from 40 GB to 500 GB, although it is possible to find some specialized, high-end computers with storage space measuring up to 2 terabytes (TB). As with everything else in computing, these numbers tend to increase with each new model. Hard drives are traditionally permanent storage devices fixed inside the system unit.

- **Floppy disk drive**—The floppy disk drive was the original storage device for microcomputers. Floppy disks are magnetic media capable of holding up to 1.44 megabytes (MB) of data, and are an example of portable storage. Although floppy disks are still a viable storage
method for small, text-based files, their limited capacity makes them ill-suited for larger graphics or multimedia files. They can be useful for saving and transporting small files, or backing up individual files for safekeeping. Floppy drives are considered legacy technology and many newer computers no longer include them as standard equipment, primarily because other higher-capacity storage methods are beginning to replace this old standby. If you can’t live without one, it might be possible to special order a floppy drive if you purchase a customized computer or to install one after the fact.

- **CD and/or DVD drives**—Your computer may have one, two, or none of these optical drives. As a general rule, new computers come equipped with at least a CD drive to provide an option for portable storage. It’s important to know whether this drive is a simple CD-ROM drive, which can only read CDs, or if it is a CD-RW drive, also known as a CD burner. A **CD burner** gives you the ability to save, or burn, files to a CD. You might also have a separate drive that can read and/or write DVDs. Another configuration is to have only one optical drive: a CD-RW/DVD drive.

Although CDs and DVDs look alike, DVDs are capable of holding much more information than CDs. A CD can hold up to 700 MB of data, but a DVD can store almost 10 GB! Because of their differences, a CD drive is unable to read DVDs, although a DVD drive can read CDs.

**Is it possible to add a storage device to a system?** If your system doesn’t have a particular storage device, it may be possible to add it—if your system has enough room for it. You would need an available drive bay, which is the physical location within the system unit, or you might consider removing an existing device and replacing it with another. For instance, if you only have a CD-ROM drive you could remove that and replace it with a CD-RW/DVD drive, thereby giving you the ability to read and burn CDs and play DVDs too. It is also possible to purchase many of these units as external storage devices. An external storage device is a peripheral that attaches to the computer and performs the same tasks as its corresponding internal device. One of the most popular of these is the external hard drive, which can greatly increase a computer’s storage capacity.

**Are there other types of storage devices?** Other storage devices you might be familiar with include **flash drives**, a newer form of data storage, as well as two older, legacy drives—**Zip drives** and **backup tape drives**.

- **Flash drives** are removable storage devices that use flash memory and connect to the computer by a USB port. Flash drives are also known as thumb drives, universal serial bus (USB) drives, and jump drives. The flash drive is typically a device small enough to fit on a keychain or in a pocket and, because of its solid-state circuitry and lack of moving parts, it is extremely durable. Available in several storage sizes ranging from 16 MB to 64 GB, a flash drive is a quick and easy way to save and transport files. As an example, a 64-MB flash drive, which is relatively small, holds the equivalent of almost 45 floppy disks! To use one of these devices, you simply plug it into a computer’s USB port. The computer recognizes the new device and enables the user to save or retrieve files from the flash drive.
• **Zip drives** are magnetic storage devices that save data to Zip disks. Zip disks appear similar to floppy disks but are capable of holding 100 MB, 250 MB, or 750 MB of information. Some older computers may include an internal Zip drive, but they are more often found as external storage devices. Zip drives were popular in earlier computers, but they are rarely found in newer models because they have been replaced by the more efficient and affordable optical and flash drives.

• **Backup tape drives** are storage devices that resemble audiocassette tape recorders and save data to magnetic tape. Although they are rarely used for home computers anymore, many businesses and organizations still rely on tape backup systems to safeguard their data on a daily basis.

The capacity of the components found in your system unit is measured in terms of storage size or speed. Computer systems continue to increase in storage capacity and computing speed, while decreasing in size. Generally, higher measurements indicate a system that is quicker and more powerful than a system with lower measurements. However, it is important to balance size and speed with financial considerations too. Although it is tempting to consider buying a computer with the most power possible, a lesser computer may be more reasonably priced and still be sufficient for the typical user’s needs. Recall that CPU speed is measured in megahertz (MHz) or gigahertz (GHz). The amount of RAM in a computer is generally measured in megabytes (MB), while storage space is usually measured in megabytes or gigabytes (GB), depending on the device. Figure 1.6 illustrates an explanation of the various measurements and how they relate to each other.

**Evaluating Your System**

Now that you have seen some of the items you can find in a computer, you might wonder about your computer’s features. If you’re new to computers, you might not know all the details about your computer, especially if you didn’t buy it brand new. If you did buy a new computer, the easiest way is to check your paperwork—all the basic information should be there. However, if your computer isn’t new or you didn’t keep the paperwork, there are some ways to determine exactly what is in your system.

**What kind of computer do you have?** This is one of the easiest questions to answer. Like almost every other appliance you’ve used, you can probably find the manufacturer’s name and a brand name or model number on the case of the computer. If not, check the back of the unit; there should be a metal tag that will include the manufacturer name, model number, and serial number.

**What operating system does the computer use?** If you watch carefully as a computer boots up, you can often determine the operating system. If the computer uses Microsoft Windows, you will usually see a splash screen display for a few moments, showing the version of Windows that is running (for example, Windows 95, Windows 98, Windows Me, Windows XP, Windows Vista, and so on).

**How much memory is in the computer? What is the type and speed of the CPU?** To determine how much memory or RAM is
### How Much Is a Byte?

<table>
<thead>
<tr>
<th>Name</th>
<th>Abbreviation</th>
<th>Number of Bytes</th>
<th>Relative Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte</td>
<td>B</td>
<td>1 byte</td>
<td>Can hold one character of data.</td>
</tr>
<tr>
<td>Kilobyte</td>
<td>KB</td>
<td>1,024 bytes</td>
<td>Can hold 1,024 characters or about half of a typewritten page double-spaced.</td>
</tr>
<tr>
<td>Megabyte</td>
<td>MB</td>
<td>1,048,576 bytes</td>
<td>A floppy disk holds approximately 1.4 MB of data, or approximately 768 pages of typed text.</td>
</tr>
<tr>
<td>Gigabyte</td>
<td>GB</td>
<td>1,073,741,824 bytes</td>
<td>Approximately 786,432 pages of text. Because 500 sheets of paper is approximately 2 inches, this represents a stack of paper 262 feet high.</td>
</tr>
<tr>
<td>Terabyte</td>
<td>TB</td>
<td>1,099,511,627,776 bytes</td>
<td>This represents a stack of typewritten pages almost 51 miles high.</td>
</tr>
<tr>
<td>Petabyte</td>
<td>PB</td>
<td>1,125,899,906,842,624 bytes</td>
<td>The stack of pages is now 52,000 miles high, or about one-fourth the distance from the Earth to the moon.</td>
</tr>
</tbody>
</table>

**Figure 1.6**

installed, or which model and type of CPU is in the system, locate the My Computer icon on your desktop and right-click it. Select Properties from the resulting shortcut menu. As you see in Figure 1.7, the General tab of the System Properties dialog box provides a lot of information about your system. This view shows you the operating system used on the computer, which is helpful if you didn’t see the splash screen at startup, and also to whom the system is registered. Additionally, you can determine the computer manufacturer and model name, the type of CPU and its chip speed, and the amount of memory or RAM that is installed.

In Figure 1.7, the computer shown is running Windows XP Home Edition with Service Pack 2 installed. It has an Intel Pentium 4 chip, with a speed of 1,600 MHz, which is equivalent to 1.60 GHz. In addition, this system has 512 MB of RAM.
How do you determine what drives are on the system and how much storage space is available? It’s important to know how much information you can store on your computer and how much room you have left. Is there enough storage space or is the computer getting full? Use My Computer to find the answers. Double-click the My Computer icon on the desktop to open a dialog box that displays your hard disk drive (or drives), in addition to all the removable storage devices attached to your system. For more information about your hard drive (or any other storage device), choose the drive you want to look at, and then right-click. Click Properties from the resulting menu. A new dialog box displays, similar to the one shown in Figure 1.8. The pie chart displayed on
the General tab is a good visual tool that shows the size of your hard drive and how much space is in use.

**Ports**

**What are ports?** The wires and plugs at the back of a computer can seem intimidating. A *port* acts as an interface between a system's peripheral devices and the computer, enabling data to be exchanged once they are connected. As you can see on the back of the notebook shown in Figure 1.9, ports can be different shapes and sizes. The same ports are typically found on a desktop too, although they might be arranged in a different order. Various input and output devices use different data exchange methods, requiring different types of ports and connectors (or plugs).

**How do you determine which port a peripheral device needs?** Manufacturers have attempted to make the process of connecting peripheral devices less complicated on newer computers. Rather than trying to match the size and shape of a connector to its port, many manufacturers now use a color-coding system that coordinates the colors of the connectors with their corresponding ports. Additionally, many newer desktop computers include ports, such as USB and audio ports, on the front panel of the system unit to provide easier access to them, as shown in Figure 1.10. Locating these ports on the front panel makes it a simple process to connect and disconnect devices that are used only occasionally, such as digital cameras or MP3 players. Peripherals that are rarely disconnected, such as a keyboard or printer, are generally plugged into the ports on the back of the computer.
What are the different ports used for? Serial and parallel ports are two of the oldest types of ports found on a computer. **Serial ports** are ports that can send data only one bit at a time, so the data exchange rate is slow compared to newer technology. The maximum rate at which a standard serial port can transfer data is 115 kilobits per second (Kbps). The mouse and modem are examples of devices that might use a serial port. A **parallel port** is a port that sends data in groups of bits, at transfer rates of up to 500 Kbps, so it is a considerably faster method of transferring data than the serial port. Older printers were often connected to a computer through a parallel port.

Are there faster ports? Over the years, newer ports have come into existence. One of these is the **universal serial bus (USB) port**. This type of port is able to interface with several different peripheral devices, which reduces the need for individual, dedicated ports. USB ports are also able to transfer data at extremely high rates of speed. Original USB ports, known as USB 1.1, are capable of speeds of 12 megabits per second (Mbps). The newest version, USB 2.0, can attain a rate of 480 Mbps—40 times faster than USB 1.1 technology and over 400 times faster than a serial port! USB 2.0 ports are backwards compatible, which means that older USB devices work with them, however, data will only transfer at the slower USB 1.1 speed. The higher data transfer capabilities of USB ports, coupled with their capability to work with multiple devices, have made the older serial and parallel ports obsolete. Because of the USB port’s speedy data transfer rate and its ability to be used with numerous devices, new computers often include four or more USB ports. Devices using USB ports include keyboards, mice, printers, MP3 players, and PDAs. In general, it’s a good idea to get a computer with as many USB ports as possible.

The **FireWire port**, developed by Apple and also known as IEEE 1394, is another means of transferring data quickly. The FireWire 400 has a data transfer rate of 400 Mbps, while the newer FireWire 800 transfers data at a blazing 800 Mbps! This port is typically used to connect devices that need to transfer huge amounts of data to a computer quickly, such as digital cameras or digital video recorders, or external hard drives. FireWire ports are standard on many Apple products, but are usually found only on higher-end Windows PCs and peripheral devices. Some peripheral devices offer users a choice of connecting using a USB port or a FireWire port.

What kind of port is used to connect to another computer? **Connectivity ports**, such as Ethernet and modem ports, are used to connect a computer to a local network or to the Internet. An **Ethernet port**, also known as an RJ-45 jack, resembles a standard phone jack, but is slightly larger. The Ethernet port is used for network access and can also be used to connect a cable modem or router for Internet access. A **modem port** is the same size and shape as a phone jack and is used to connect the modem to a phone system, enabling dial-up Internet access. The maximum data transfer rate for a modem is 56 Kbps, while the most common Ethernet standard, Fast Ethernet, transfers data at the rate of 100 Mbps. However, Gigabit Ethernet, with a potential transfer rate of 1,000 Mbps, is becoming an option on higher-end systems, and is standard on many Mac systems.
Even faster Ethernet technologies, such as 10 Gigabit Ethernet or 10GbE, exist, but they are currently used for network backbones and enterprise network infrastructures, rather than home users. The table in Figure 1.11 lists some of the different types of ports and the devices that use them.

### Ports and Their Uses

<table>
<thead>
<tr>
<th>Port Name</th>
<th>Port Shape</th>
<th>Connector Shape</th>
<th>Data Transfer Speed</th>
<th>Typical Devices Attached to Port</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legacy Technologies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serial</td>
<td></td>
<td></td>
<td>115 Kbps</td>
<td>Mice, External modems</td>
</tr>
<tr>
<td>Parallel</td>
<td></td>
<td></td>
<td>500 Kbps</td>
<td>Printers, External Zip drives</td>
</tr>
<tr>
<td>USB 1.1</td>
<td><img src="image" alt="USB 1.1 shape" /></td>
<td><img src="image" alt="USB 1.1 connector shape" /></td>
<td>12 Mbps</td>
<td>Mice, Keyboards, External Zip drives, Printers, Scanners, Game controllers</td>
</tr>
<tr>
<td><strong>New Technologies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>USB 2.0</td>
<td><img src="image" alt="USB 2.0 shape" /></td>
<td><img src="image" alt="USB 2.0 connector shape" /></td>
<td>480 Mbps</td>
<td>Same as USB 1.1, but at faster transfer rates</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Also suitable for camcorders and digital cameras</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maintains backward compatibility with USB 1.1</td>
</tr>
<tr>
<td>FireWire/ FireWire 800</td>
<td><img src="image" alt="FireWire shape" /></td>
<td><img src="image" alt="FireWire connector shape" /></td>
<td>400 Mbps/ 800 Mbps</td>
<td>Digital video camcorders, Digital cameras</td>
</tr>
<tr>
<td>Ethernet/ Gigabit Ethernet</td>
<td><img src="image" alt="Ethernet shape" /></td>
<td><img src="image" alt="Ethernet connector shape" /></td>
<td>Up to 100 Mbps/ Up to 1,000 Mbps</td>
<td>Network connections, Cable modems</td>
</tr>
</tbody>
</table>

**Are there special purpose ports?** Despite the prevalence of USB ports, which can be used for a variety of peripherals, there are still some devices that require special ports. These ports include Musical Instrument Digital Interface (MIDI), IrDA, Bluetooth, video, and audio ports:

- **MIDI ports** are used to connect electronic musical devices, such as keyboards and synthesizers, to a computer, enabling musicians to create digital music files.
• The **IrDA port** is used to allow devices such as PDAs, keyboards, mice, and printers to transmit data wirelessly to another device by using infrared light waves. In order to transmit information, each of the devices must have an IrDA port, as well as a clear line of sight, with no other objects blocking the transmission.

• **Bluetooth** is another type of wireless technology that relies on radio wave transmission and doesn’t require a clear line of sight. Bluetooth-enabled devices such as PDAs or other mobile devices can only communicate with each other over short distances, typically less than 30 feet.

• Video ports include standard monitor ports, DVI ports, and S-video ports. A **monitor port** is used to connect the monitor to the graphics processing unit, which is usually located on the motherboard or on a video card. However, to get the best results from a flat panel (LCD) monitor, the **Digital Video Interface (DVI) port** should be used instead. The DVI port transmits a pure digital signal, eliminating the need for digital-to-analog conversion and resulting in a higher quality transmission and a clearer picture on the monitor. The **S-video port** is typically used to connect other video sources, such as a television, projector, or digital recorder, to the computer.

• Similar to video ports, **audio ports** connect audio devices, such as speakers, headphones, and microphones, to the computer’s sound card. These jacks will probably be very familiar to anyone who is accustomed to using standard stereo components.

**Input Devices**

The system unit and its storage devices process and store data. However, before that can happen, you need to get the data into the system. You also need a way to get the processed data back out of the system. **Input and output devices** are used to enter and retrieve the data in a useful format.

The two most familiar input devices are the keyboard and the mouse, but they aren’t the only ones. This section discusses each of these devices, in addition to some other useful devices used to get data into the computer.

**Keyboards**

**Are there different types of keyboards?** The **keyboard** is the primary input device for computers. There are actually several different kinds of keyboards. The QWERTY keyboard is the one most people are familiar with. It is based on the original typewriter keyboard and is named for the arrangement of the letters on the top-left alphabetic row of keys. Another style is the Dvorak keyboard, which arranges the letters and numbers in a different pattern for increased typing speed. Some ergonomic keyboards use a split keyboard arrangement, offsetting each half at an angle to reduce the incidence of repetitive stress injuries such as carpal tunnel syndrome.

Keyboard size and layout on notebook and tablet computers can differ slightly from a standard desktop keyboard. Keyboards usually send information to the computer through a cable connected to a USB port; however, wireless or remote keyboards are gaining in popularity. A wireless
keyboard communicates with the computer by infrared or radio frequency technology and also requires batteries.

**What are all these other keys used for?** In addition to the standard alphanumeric keys originally found on typewriters, computer keyboards have a variety of keys that provide additional functionality. Many of these keys are shown in Figure 1.12 and include

- **Control keys**, such as the Ctrl, Alt, and Windows keys, often provide shortcuts or increased functionality to the keyboard when used in combination with another key. If you press the Shift key and a letter, the result is an uppercase, rather than a lowercase, letter. In the same way, using one of the control keys enables the standard keys to be used for additional purposes. For example, pressing Ctrl and the letter P opens the Print dialog box. Another example of a control key is the Esc key, which can often be used to stop, or escape, from a currently running task. A unique control key that is found only on Windows-based keyboards is the Windows key.

- The **numeric keypad**, located at the right of the keyboard, provides an alternate method of quickly entering numbers. This is useful for individuals who are accustomed to using an adding machine or calculator.

- **Function keys** are located above the standard row of number keys. Numbered F1 through F12, these keys are generally associated with certain software-specific commands. Pressing the F1 key will usually open the Help menu for a program; however, pressing one of the other function keys can produce different results, depending on the software program running.

- **Arrow keys** are the keys located at the bottom of the keyboard between the standard keys and the numeric keypad. These keys enable the user to move the insertion point around the window one space at a time.

- **Toggle and other keys**, which are located just above the arrow keys, are used for various purposes, including navigation and editing. The Insert, Num Lock, and Caps Lock keys are all examples of toggle keys. A toggle key works just like a light switch—press it once and the feature is turned on, press it again and it is turned off. If you’ve ever accidentally pressed the Caps Lock key and typed a long string of all capital letters, you’ve seen this feature in action. Pressing the Caps Lock key again allows you to return to normal keyboarding mode.

- **Multimedia and Internet control keys** are typically found at the top edge of the keyboard. The precise placement and function of these keys usually depends on the keyboard manufacturer. However, most modern keyboards have at least a few keys or buttons that can be used for such tasks as muting or adjusting speaker volume, opening a Web browser, and sending an e-mail. Generally, each button has an icon that indicates its function.
The Mouse

**Is there an easier way to control cursor movement?** The mouse became an essential input device with the introduction of graphical user interfaces, such as Microsoft Windows. This point-and-click device is useful for positioning the insertion point by translating hand movements into corresponding actions on the screen. If the mouse has a rollerball on the bottom, you also need a mousepad to create the friction necessary for the mouse to track properly. Optical mice use a laser beam, instead of a rollerball, to control the pointer movement. Because the bottom of an optical mouse is sealed, dirt and debris are less likely to get inside and interfere with the mouse’s internal mechanisms. Such mice don’t require mousepads, although many people continue to use one. Just as with keyboards, mice can be wired or wireless. Notebook and tablet computers can use mice, or they may use a built-in touchpad, trackball, or trackpoint to move the insertion point.

**How can the mouse be used more efficiently?** Although there are different kinds of mice, the traditional mouse has two buttons and a scroll wheel. The palm of your hand should rest comfortably over the mouse. For the best and most accurate results when you click the mouse, simply press the button with your finger. Often, people who are new to computing think they need to lift their finger and press hard to click a mouse button. This can actually create problems by causing the mouse to move suddenly, making clicking inaccurate. The following provides a brief description of some of the ways the mouse can be used:

- **Click**—By default, the left mouse button is considered the primary button. When instructed to click the mouse, it is understood this means that the left mouse button should be pressed one time. Clicking is done to position the insertion point or to select an object on the screen.
• **Double-click**—Double-clicking is performed by pressing the left mouse button two times in rapid succession. It is important that the mouse does not move while double-clicking or the command will not produce the expected results. Double-clicking is done to activate an object; for example, you double-click to open a file or start a program.

• **Drag**—To carry out this action, press the left mouse button and continue to hold it while dragging, or moving, the mouse. This action can be used to select large blocks of text.

• **Right-click**—Pressing the right mouse button one time will open a shortcut menu. Shortcut menus are usually context-sensitive, which means they will vary depending on what you’ve clicked and what program you are using. The right mouse button is also known as the secondary button and is not typically pressed more than one time—no double-clicking for the right button. After the shortcut menu has been opened, you select the appropriate choice by clicking it with the left mouse button.

• **Scroll wheel**—If your mouse is equipped with a scroll wheel, it can be used to quickly move a page up or down in a window. It is an easy way to navigate through lengthy documents or Web sites.

**Are there other input devices?** Although the keyboard and mouse are the two most common input devices, there are many other input devices. **Scanners** are similar to copy machines, but instead of producing a paper copy, they convert documents or photos to digital files that can then be saved on your computer. **Microphones** are used to digitally record sounds. Game controls such as **joysticks** are used to control movement within games. **Digital cameras** and **digital video recorders** enable you to transfer digital images of photos and movies directly to your computer.

**Output Devices**

Output devices help you retrieve data that has been entered, processed, and stored in your system and present it in a useful format. This format can be text, graphics, audio, or video. Monitors and printers are the two most common output devices.

**Monitors**

**What are monitors?** Monitors, also known as **display screens**, are an essential component of the computer system. Text, video, and graphics are displayed on a monitor. When a monitor outputs data or information, it is called **soft copy**—you can view it, but you can’t touch it.

**What is the difference between a CRT monitor and an LCD monitor?**

Monitors come in a variety of sizes and styles, but, as shown in Figure 1.13, there are just two main categories: **cathode-ray tube (CRT)** and **liquid crystal display (LCD)**. A CRT monitor resembles a traditional television set and uses a cathode-ray tube to produce the picture on the screen. The glass screen of a CRT monitor can be curved or flat (sometimes called a **flat screen** monitor). The flat screen generally has less glare. It is important not to confuse a flat screen monitor with a flat panel monitor. **Flat panel** or LCD monitors use a liquid crystal display and are much thinner and lighter than CRT monitors. They are also more expensive than CRTs, although they have become more affordable in recent years.
What factors determine a monitor’s display quality? A monitor’s display is made up of millions of tiny dots, known as pixels. Each pixel, which is short for picture element, represents a single point on a display screen or in a graphic image. The number of pixels on the screen determines a monitor’s sharpness and clarity, also known as its resolution. A higher number of pixels results in a clearer and sharper monitor resolution. A standard screen resolution might be expressed as 1024 x 768, which means there are 1,024 columns, each containing 768 pixels, for a total of more than 786,000 pixels on the screen.

Dot pitch is another display characteristic and refers to the diagonal distance between two pixels of the same color. Dot pitch is measured in millimeters with smaller measurements resulting in a crisper viewing image because there is less blank space between the pixels. For best viewing, monitors should have a dot pitch measurement of .28 mm or less. CRT monitors use an electric beam to light up the pixels. The electric beam quickly passes back and forth across the back of the screen, relighting the pixels and redrawing the screen image. LCD monitors use an electric current to illuminate the pixels. The speed at which the pixels are reilluminated is called the refresh rate, which is measured in cycles per second, expressed as hertz (Hz). Refresh rates generally average between 75 and 85 Hz, which means the screen image is redrawn 75 to 85 times per second. Higher refresh rates result in less screen flicker and less eye strain.

How are a monitor’s color settings and display size determined? Although monochrome monitors were the standard in the early days of computers, color monitors are more common now. Modern monitors can display at least 256 colors and most can display up to 16.8 million colors. Monitor sizes range from 14 to 40 inches or larger. Desktop computers use CRT or LCD monitors, whereas notebook and tablet computers use LCD screens. Popular desktop sizes include 17-inch, 19-inch, and 21-inch monitors. Notebooks tend to have slightly smaller LCD screens, which range from 12 to 17 inches. Monitor sizes are determined by measuring them diagonally. However, the measurement for a CRT monitor includes the outer housing, which makes the actual viewing area of the monitor smaller than the size indicated. LCD monitor measurements do not include the bezel, or edge, of the screen. Because of these different
measurement methods, a 17-inch LCD monitor has virtually the same viewing area as a 19-inch CRT monitor.

Which type of monitor is best? Consider some of the following questions to help make your decision. How much can you afford to spend? Do you have the room for a CRT monitor or is your workspace limited? How important is color accuracy to you or your work?

There are advantages and disadvantages to both types of monitors, and the ultimate decision should be based on which one will work best for you. CRT monitors are cheaper and tend to display colors better; however, LCD monitors are becoming less expensive. LCD monitors are also smaller and lighter weight, with a larger display screen than similarly sized CRTs. Figure 1.14 compares the advantages for both CRT and LCD monitors to help you decide which style best suits your needs.

<table>
<thead>
<tr>
<th>CRT Monitor Advantages</th>
<th>LCD Monitor Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Images viewable from all angles (LCD monitors often have a limited viewing angle).</td>
<td>Take up less space and weigh less.</td>
</tr>
<tr>
<td>Resolution can be adjusted more completely.</td>
<td>Cause less eye strain than CRT monitors.</td>
</tr>
<tr>
<td>Better color accuracy and clarity.</td>
<td>Are more environmentally friendly than CRT monitors.</td>
</tr>
<tr>
<td>Better for gaming and watching DVDs due to quicker pixel response time and higher color accuracy than LCD monitors.</td>
<td>Larger viewable area compared with similar sized CRT (17-inch viewable area on 17-inch monitor compared with 15-inch viewable area on a 17-inch CRT monitor).</td>
</tr>
</tbody>
</table>

Figure 1.14

Printers

Using a monitor is a good way to view the information on your computer, but sometimes a soft copy isn’t sufficient for your needs. The ability to generate a hard copy—a permanent record of your work—is the primary benefit of a printer.

What types of printers are available? There are two categories of printers: impact and nonimpact. Impact printers have small keys, similar to a typewriter’s, that strike an ink ribbon against paper, leaving behind an image of the character on the key. The dot matrix printer is an impact printer. One of the earliest printers, the dot matrix printer has been almost completely phased out by newer types of printers. Despite this, the dot matrix printer can still be found in some business settings because it is useful for printing multipage forms such as invoices or purchase orders.

How does a nonimpact printer work? Nonimpact printers do not actually touch the paper when printing. There are a variety of nonimpact printers, but the two most commonly used with home computers are the
ink-jet printer and the laser printer. Figure 1.15 shows a typical example of each of these printers. The **ink-jet** printer uses a special nozzle and ink cartridges to spray ink in small droplets onto the surface of the paper. Ink-jet printers are able to easily print in color and in black and white, produce good quality copy, and are relatively inexpensive to buy. **Laser** printers use the same process as photocopiers to produce their output. They use a special cylinder known as a drum, dry ink or toner, and a laser. Static electricity attracts toner to the surface of the drum and the laser distributes the toner in the correct pattern. The drum transfers the toner to the paper and heat is used to permanently fuse the toner to the paper. Laser printers are generally more expensive to purchase than ink-jet printers, although they often print more quickly and are more cost-effective. Lower-end laser printers print only in black and white; however, more expensive printers can produce color copies.

**Figure 1.15**

(a) Ink-jet printer  
(b) Laser printer

**How do you assess a printer’s capabilities?** When you select a printer, there are some key characteristics to consider. The first of these is print speed, often described as pages per minute (ppm). Print speed can vary depending on the manufacturer and model, and is also affected by whether the page is text-only or if it also includes graphics. Just as with monitors, resolution is also important to print quality. For printing purposes, resolution is expressed as **dots per inch** or **dpi**. The higher the dpi, the better the print quality. Print qualities of 300 to 600 dpi are typical of most printers, although special photo printers can offer resolutions up to 1,200 dpi. Professional printers can reach even higher values. Color output and its related cost is another important consideration. Ink-jet printers offer four- or six-color options. Many ink-jet printers use one cartridge for black ink and another for color. When available, printers that offer a separate cartridge for each color are a practical choice because you only need to replace one color at a time as the cartridges run out. Laser printers use separate toner cartridges for each color.

**Speakers and Multimedia Projectors**

**Are there other output devices?** **Speakers** and **multimedia projectors** are also examples of output devices. Many computers include small speakers to allow the user to listen to CDs or DVDs and hear any auditory signals the computer sends. However, if you’re serious about
multimedia, you will probably want to invest in a better set of speakers for improved performance. Multimedia projectors are used to conduct presentations and training sessions. Imagine how difficult it would be to have a room full of students or conference attendees crowd around a single monitor to view a presentation. A multimedia projector allows information to be projected onto a larger screen so it can easily be viewed by a group.

Multifunction Devices

Some devices, known as **multifunction devices (MFDs)**, combine input and output capabilities. A good example of such a device is the telephone, which allows you to both speak (output) and listen (input) to another person. Other examples include the touchscreen monitor at a convenience store or ATM or the “all-in-one” printer, which combines a printer with a scanner, copier, and fax machine. In each instance, you can use the device to input information by touching the screen to make your selection or by using the device’s scanning capability. At the same time, each of these devices displays information on the screen or generates printed copies to output information.

**Objective 4**

**Identify Types of Software and Their Uses**

Computer hardware consists of the physical components of the system. However, without software, the computer would just be a collection of mechanical parts. Software provides the instructions that tell the computer what to do. To perform various tasks, the computer requires a set of instructions, called **programs**. These programs enable individuals to use the computer without the need for special programming skills. There are two categories of computer software: system software and application software. Both types of software are required to work effectively with your computer.

**System Software**

**System software** provides the instructions that the computer needs to run. It contains the directions needed to start up the computer (known as the **boot process**), checks to ensure everything is in good working order, and enables you to interface with the computer and its peripheral devices so that you can use them. System software consists of two main types of programs: the operating system and utility programs.

**Operating Systems**

**What is the operating system?** The **operating system (OS)** is a special computer program that is present on every desktop or notebook computer, in addition to many others ranging from mainframes to PDAs. The operating system controls the way the computer works from the time it is turned on until it is shut down. As shown in Figure 1.16, the operating system manages the various hardware components, including the CPU, memory, storage devices, and peripheral devices. It also coordinates with the various software applications that might be running.
Is it possible to communicate with the operating system? Although the operating system communicates with the computer and its peripherals, it also includes a user interface that you can use to interact with the computer. Early operating systems used a DOS-based interface, which required knowledge of special commands that had to be typed accurately to achieve the desired results. As you can imagine, this type of system was not very user-friendly. Most current operating systems use a point-and-click format known as a graphical user interface (GUI). GUIs are more user-friendly and intuitive than DOS systems. Rather than typing specific commands, you can use a mouse to point to and click on an icon (a graphical depiction of an object such as a file or program) or a menu (a list of commands) to perform a task. GUI operating systems display information on the monitor in the form of rectangular boxes called screens or windows.

Do all computers need an operating system? The operating system is a critical part of a computer system. Without an OS to provide specific instructions, the computer would be unable to fulfill its four main functions. However, different computers require different types of operating systems. There are several popular operating systems available for home computers. They include Microsoft Windows, Mac OS, and Linux.

Microsoft Windows has the largest market share of the three main operating systems and is found on most of today’s desktop and notebook
computers. There have been many versions of Microsoft Windows, including Windows 3.0, Windows 95, Windows 98, Windows ME, and Windows Vista. Although a previous version of Windows might be found on an older computer, Windows Vista is the current version installed on most computers. A sample Windows XP desktop is displayed in Figure 1.17.

**Why are there so many versions of Windows?** Software developers are always updating and refining their software to adapt to new technology, respond to vulnerabilities, and improve their product. Because Microsoft also manufactures application software, some of its products have similar names and users can become confused. It’s important to note that even though your computer might use Microsoft Windows for its operating system, it may not have Microsoft Office (an application software suite) installed.

**Mac OS** is an operating system designed specifically for Apple’s Macintosh computers. The current version is Mac OS X Tiger. As you can see in Figure 1.18, the Mac OS appears similar to Windows, because it also uses a GUI. In fact, Apple was the first company to introduce a GUI operating system for commercial sale. But, because of the overwhelming popularity of the Windows-based PC, Mac OS has a much smaller market share. There are also significant differences in the way the Mac OS performs. Mac users tend to be very loyal and believe their system is far superior to the Windows system, although there are many Windows users who disagree.
Can Windows run on an Apple computer? Until recently, the Mac OS could not run on a PC, and the Windows OS could not run on a Mac. This was primarily due to the differences in CPUs used by each system. However, now that Apple is also using Intel chips, the concept of a dual-boot computer (one that can run more than one operating system) running both Mac and Windows operating systems on the same computer has become a reality. Apple has developed Boot Camp, a utility program that will allow Windows XP to be installed on a Mac. While this may appeal to some users—especially those who want to use a Mac but have some applications that will only run on Windows—it is still in the early stages and may not be a good option for everyone.

Linux is an alternative operating system. Based on the UNIX operating system developed for mainframe computers, it also has a dedicated group of users. Linux is an open-source operating system, which means it is not owned by a single company and some versions are available at no cost.

How is open-source software different from other types of software? Open-source software makes its source code, essentially the program instructions, available to anyone who would like to see it. Programmers are encouraged to work with and change the code as they see fit, in the hope that having many “eyes” looking at the code will streamline and improve it. Proprietary software, such as Microsoft Windows, keeps this code secret and inaccessible to programmers who are not authorized by the software development company.

Why is Linux used? Linux is rarely used by novice computer users, although it is popular among developers and other technology-advanced individuals who prefer to use an alternative operating system.
Some people appreciate the opportunity to work in this more “open” programming environment. However, one of the disadvantages of Linux is that, because no single company is responsible for it, technical support is not easily found. Users might find help from various resources such as user groups and Internet communities. Alternatively, some software companies have chosen to develop and sell a version of Linux that includes a warranty and technical support as a way of alleviating user concerns. Figure 1.19 shows an example of one version of the Linux operating system.

**Utility Programs**

*What are utility programs?* Operating system software is the most critical software on the computer, because nothing can run without it. However, utility programs are another important component of system software. These small applications handle many important tasks involved with the management and maintenance of your system. Utility programs can be used to help back up important files, remove unwanted files or programs from your system, and schedule various tasks to keep your system running smoothly. Some of these utilities are included with the operating system, whereas others are stand-alone versions that you can purchase or download for free. Figure 1.20 displays a variety of utility programs that ship with the Windows operating system and compares them with similar stand-alone products, describing the function of each utility.
Objective 4: Identify Types of Software and Their Uses

Application Software

Although you interact with system software every time you use the computer, in some ways you don’t really notice it. Application software, on the other hand, is comprised of programs that enable you to accomplish tasks and use the computer in a productive manner.

How do system software and application software work together?

System software is a bit like breathing—you need to do it to live; however, you don’t usually think much about it unless something goes wrong. Application software might be compared to a musical instrument like a flute. When a musician combines each of these—her breath and her flute—the result may be a beautiful melody (if she has practiced, of course!). Computer software works together similarly—the system software acts as the “breath,” while the application software provides the “instrument,” enabling you to create something too.

There are many different kinds of application software, although they often fall into one of several general categories, each of which has a different purpose. These categories include financial and business-related software, graphics and multimedia software, educational and reference...
software, entertainment software, and communication software. You might be most familiar with productivity software, which includes the following applications:

- **Spreadsheet software**—Spreadsheet software enables you to perform calculations and other mathematical tasks. Similar to the documents used by accountants, spreadsheets contain data entered in columns and rows and enable you to perform calculations, create scenarios, perform “what-if” analyses, chart and graph data, and format the worksheet layout. A key advantage of spreadsheet software is its capability to recalculate spreadsheets without user intervention. When data used in a calculation or formula is changed, the spreadsheet software automati-
cally updates the worksheet with the correct result. Microsoft Excel, Lotus 1-2-3, and Corel Quattro Pro are examples of spreadsheet programs. Figure 1.22 shows a worksheet created in Microsoft Excel 2007.

- **Word processing software**—Used to create, edit, format, and save documents and other text-based files. Word processing software enables you to create or edit letters, reports, memos, and many other types of written documents and print them out. Revisions to existing documents can be made quickly and easily, without having to re-create the entire document. Documents created with this type of software can also include graphics, charts, and other graphic elements. Microsoft Word, Lotus Word Pro, and Corel WordPerfect are all examples of word processing programs. A document created using Microsoft Word 2007 is shown in Figure 1.21. Notice that the document contains a graphic element as well as text.

   ![Facsimile Transmittal Sheet](image)

   **Figure 1.21** Facsimile Transmittal Sheet

   TO: Caroline Westbrook  
   FROM: John Davenport  
   DATE: July 24, 2009  
   FAX: (513) 555-0029  
   RE: Senior Contract From Music School Records

   As you requested, I have incorporated the contract changes we discussed yesterday. Please take a few minutes to review it, and then send me any comments you might have.

   If the terms are acceptable, please let me know and I will send copies of the contract to you for your client’s signature.

   You can reach me at (512) 550-9029 during normal business hours.

   ![Figure 1.22](image)
Database software—Databases are used to store and organize large amounts of data. Typically, database software can be used to manage various types of information, such as that found in large mailing lists, inventories, order histories, and invoicing. Databases help you to enter, store, sort, filter, retrieve, and summarize the information they contain and then generate meaningful reports. Common database programs include Microsoft Access, Lotus Approach, and Corel Paradox. Figure 1.23 shows a database table created in Microsoft Access 2007.
• **Presentation software**—Because of presentation software, lecturers no longer need to rely on flip charts, slide projectors, or overhead transparencies for their presentations. This software is used to create graphic presentations, known as slide shows, that can be shown to large groups by means of an overhead projector or displayed on the Web. Presentation software is also used to create audience handouts, speaker notes, and other materials that can be used during an oral presentation or for distribution to an audience. Microsoft PowerPoint, Lotus Freelance Graphics, and Corel Presentations are examples of presentation software programs. Figure 1.24 shows a presentation created with Microsoft PowerPoint 2007.

![Presentation software example](image)

• **Communication and organizational software**—Communication software can cover a broad range of tasks including videoconferencing and telephony. However, applications within the productivity category are most often used to send and receive e-mail. These applications typically include an address book, a calendar, and task functions, which help users organize their personal and professional responsibilities. Microsoft Outlook, Lotus Notes, and Corel WordPerfect Mail are examples of communication and organizational software. Figure 1.25 shows an example of a calendar in Microsoft Outlook 2007.
What is a software suite? Although it is possible to buy any of the previous applications separately, most software manufacturers, including Microsoft, Corel, and Lotus, also group applications together into a package called a suite. This can be an economical way to purchase software if you need some or all of the programs in the suite. The cost of a suite is usually less than the total cost of purchasing each of the applications individually. Additionally, because products from the same company have many common elements, such as basic window design and layout, toolbars containing similar tools, dictionaries, and media galleries, many users find this familiarity makes it easier to switch between the programs in a suite. Examples of suites include Microsoft Office, Corel WordPerfect Office, and Lotus SmartSuite.

What are some other common software applications? As mentioned earlier, there are many different types of application software besides productivity software, each one with a specific function. You might use Microsoft Publisher or QuarkXPress to create a newsletter or brochure. Bookkeepers rely on special accounting packages such as Peachtree Accounting or QuickBooks to balance the books and handle other accounting functions. Graphic designers turn to packages like Adobe Photoshop or Adobe Illustrator to develop creative artwork. You might use Microsoft FrontPage or Macromedia Dreamweaver to create your own Web site. To identify other software programs and their uses, visit a home electronics or discount store to see which programs they stock, or browse the shelves of your local bookstore for some of the latest “how-to” information.
Objective 5
Describe Networks and Define Network Terms

What are the components of a network? Recall that computers and the various peripherals that are connected to them are called hardware. However, connecting one computer to another creates a network. Networks consist of two or more connected computers plus the various peripheral devices that are attached to them. Each object connected to a network, whether it is a computer or a peripheral device, is known as a node.

Why are computers connected to networks? Some of the benefits of computer networks include the ability to share software applications and resources such as printers and scanners. Improved communication and data sharing are additional benefits. Computers can be connected to a network in several ways. They can use existing telephone wires or power lines, or use coaxial, unshielded twisted pair (UTP), or fiber-optic cable. Networks can also be wireless, in which case they use radio waves instead of wires or cables to connect.

Can networks be different sizes? A computer network that connects computers reasonably close together, such as within a home or in a small office or business, is called a local area network (LAN). Usually these networks are contained within a single building or group of adjacent buildings. If the network begins to cover a larger geographic area or begins to include other networks, it becomes a wide area network (WAN). An example of this is the network used by Penn State University. Penn State has many campuses located across the state of Pennsylvania. Because the different campuses are connected through a WAN, students and teachers are able to use a computer in one location and access files or resources located at any of the other campuses, wherever they might be located. Both LANs and WANs can be wired or wireless. Wired LANs might use phone lines or cable connections, while wired WANs might use phone lines, satellites, or special leased lines, known as T-1 or T-3 lines, for high-speed communication. In fact, the Internet is actually the largest network of all because it connects computers around the world.

How are networks configured? Networks can be configured in several ways. There are two main categories: peer-to-peer and client/server. Peer-to-peer or P2P networks are most commonly found in homes and small businesses. In a peer-to-peer network, each node on the network can communicate with every other node. Peer-to-peer networks are relatively easy to set up, but tend to be rather small. This makes them ideal for home use, although not as desirable in the workplace. If a network has more than ten nodes, it is generally best to use the client/server network instead. Remember that a node can be a computer, printer, scanner, modem, or any other peripheral device that can be connected to a computer. Therefore, it isn’t difficult to find more than ten nodes in an office or business setting.

How is a client/server network different from a P2P network? Client/server networks typically have two different types of computers.
The **client** is the computer used at your desk or workstation to write letters, send e-mail, produce invoices, or perform any of the many tasks that can be accomplished with a computer. The client computer is the one most people directly interact with. In contrast, the **server** computer is typically kept in a secure location and is used to manage network resources. If a server is assigned to handle only specific tasks, it is known as a **dedicated server**. For instance, a Web server is used to deliver Web pages, a file server is used to store and archive files, and a print server manages the printing resources for the network. Each of these is a dedicated server.

**Network topology** describes the different types of network architecture used for client/server networks. Just as there are different sizes and styles of buildings that are designed for different purposes, networks are designed to be physically configured and connected in different ways.

**Which topologies are used most often?** The three most common layouts are explained in the following list:

- **Bus topology** connects each node to a single, central high-speed line known as a bus. No server is used, and although it is possible for each node to communicate with all the others, they can only do so one at a time. If one computer or device is sending over the network, all the others must wait until the transmission is complete before they can begin. Because this is an inexpensive and easy way to connect, this topology is often found in peer-to-peer networks.

- **Ring topology**, sometimes known as **token-ring topology**, connects each node to the next, forming a loop or a circle. The data that’s sent is passed from node to node, traveling around the circle in only one direction. A token travels around the ring until one of the nodes is ready to send a transmission. The node then holds the token until the transmission is finished, preventing any of the other devices from sending until the token is released to make its way around the circle again. This type of topology gives each device an equal chance of being able to send data and prevents one node from doing all the communicating.

- **Star topology** is the most frequent networking style used for businesses. It offers a high degree of flexibility. Each node is connected to a special device known as a switch, which is centrally located. Each node must go through the switch to communicate with the others. If something happens to one node, the others are still able to communicate.

Figure 1.26 shows an example of each of these layouts, and Figure 1.27 discusses the advantages and disadvantages of each of these topographies.
### Advantages and Disadvantages of Bus, Ring, and Star Topologies

<table>
<thead>
<tr>
<th>Topology</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bus</td>
<td>Uses a minimal amount of cabling. Easy, reliable, and inexpensive to install.</td>
<td>Breaks in the cable can disable the network. Large numbers of users will greatly decrease performance because of high volumes of data traffic.</td>
</tr>
<tr>
<td>Ring</td>
<td>Allocates access to the network fairly. Performance remains acceptable even with large numbers of users.</td>
<td>Adding or removing nodes disables the network. Failure of one computer can bring down the entire network. Problems in data transmission can sometimes be difficult to find.</td>
</tr>
<tr>
<td>Star</td>
<td>Failure of one computer does not affect other computers on the network. Centralized design simplifies trouble-shooting and repairs. Easy to add additional computers or network segments as needed (high scalability). Performance remains acceptable even with large numbers of users.</td>
<td>Requires more cable and is often more expensive than a bus or ring topology. The switch is a central point of failure. If it fails, all computers connected to that switch are affected.</td>
</tr>
</tbody>
</table>

Figure 1.26

**Figure 1.27**

38  **Computer Concepts** | Chapter 1: Basic Computer Concepts
Objective 6
Identify Safe Computing Practices

Being computer fluent implies you are a responsible computer user. This means more than just understanding the key components of a computer or the differences between hardware and software. Responsible computer users also know how to properly maintain their computers, back up necessary data, and protect themselves and others from security breaches and attacks.

Computer Maintenance

The first step to protect your computer and the valuable information it contains is to establish a regular maintenance routine. Backup utility programs, which may be part of your system software or purchased separately, enable you to back up your files. You can back up everything on your computer, just one or two important files, or anything in between. People often think that the computer is the most expensive item to replace if their hard drive fails. In reality, it is usually all the lost information that was contained on the hard drive that is the most costly to replace, if it is even possible to do so. Think about the types of files you might have on your own computer—financial records, resumes, homework or school projects, your CD collection and purchased music files, and family photos—then imagine how you would re-create these files if they were irretrievably damaged. Would you be able to find them again? If you back up files on a regular basis and store the backups in a secure location, you lessen the impact that a mechanical failure or security breach will have on your data.

What other types of maintenance tasks should be performed? In addition to backing up files, regular file maintenance also helps to maintain order in your system. Several useful Windows utilities can be accessed from the System Tools folder. You can access the System Tools folder by clicking Start, clicking All Programs, and then clicking Accessories. Disk Cleanup scans the hard drive and removes unnecessary files such as those found in the Recycle Bin, in addition to temporary Internet files and other temporary files created by various programs. It is possible to adjust the settings and select which files to delete and which files to retain.

Similarly, the Disk Defragmenter scans the hard drive. However, rather than removing files, it attempts to reallocate files so they use the available hard drive space more efficiently. Recall that data is stored on hard drives in sectors and tracks. As file sizes change, they can outgrow their original location. When that happens, the remaining portion of the file may be stored elsewhere. If a file size decreases, or a file is deleted, this can create a blank area on the hard drive. Defragmenting a hard drive enables scattered portions of files to be regrouped and open spaces to be rearranged. This results in faster and more efficient file access, which improves the response time of the hard drive.
**Is there a way to automate these maintenance tasks?** Running these programs can be time consuming, especially when you want to use your computer for other tasks. It is also easy to forget to do these things on a regular basis. That is why newer versions of Windows include a Scheduled Task Wizard. This utility, listed as Scheduled Tasks in the System Tools folder, enables you to select the best time for each task to run, in addition to how often, which makes the whole process automatic. Figure 1.28 shows the Scheduled Task Wizard being used to set up the Disk Cleanup task.

![Scheduled Task Wizard](image)

**Can changes to my system be undone?** Sometimes when new software is installed on a computer, the results are not what you anticipated. Instead of playing a new game, you find your system stops responding each time you start it. Or, you might find the new driver you installed for your printer is causing conflicts. Even though you’ve tried to uninstall the software, the system is still not right.
Fortunately, if you are running a newer version of Windows the System Restore utility (also found in the System Tools folder) can come to the rescue. Periodically, Windows creates a **restore point**, which records all the settings for your system. It’s similar to taking a picture of how everything is currently set up. See System Restore in action in Figure 1.29.

It is also possible to set manual restore points, and it is highly recommended that you set one before installing new software or hardware, or when making any major changes to your system. If you experience a problem with your system after the new software is installed, you can roll your system back to an earlier restore point when the system was working correctly. Think of it as an Undo button for your operating system. The good news is, returning to an earlier restore point affects only your system settings—it does not delete any of the data files you may have created during the interval.

**Viruses**

Establishing the habit of performing regular maintenance on your computer is one way to protect it, and yourself, from data loss. But there are many other dangers you need to be aware of too. Viruses, spyware, and hackers are all out there waiting to pounce on the unwary computer user.

**What are viruses and how do they get on the computer?** Computer viruses are malicious codes or programs that are usually installed on your computer without your knowledge and against your wishes. The severity of a virus can vary. Some viruses merely seem to be nuisances or might not even be obvious to the user; some cause files to be corrupted or erased; and others are capable of shutting down a computer and erasing the entire hard drive. Viruses infect a system and then attach themselves to a program or file to spread to other users.
Viruses can be distributed in several ways. In the early days of computers, viruses were spread by sharing infected floppy disks. Now, due to the ease in which files can be shared over the Internet, viruses are able to spread much more quickly. One of the most common ways to send a virus is through e-mail attachments. Security experts recommend that you never open an e-mail attachment unless you have first scanned it with antivirus software to determine that it is virus-free. Experts also recommend that unless you know the sender and have been expecting the e-mail attachment, it is best to delete the attachment without ever opening it. File-sharing services are another source for these types of problems.

Are viruses and worms the same thing? Worms are similar to viruses because they are also malicious programs that spread from computer to computer; however, unlike viruses, worms are able to do this without any human interaction and are able to replicate themselves so numerous copies can be sent. Worms can burrow into your e-mail address book, or locate e-mail addresses on files saved on your hard drive, then send themselves out without any help from you. When it reaches the e-mail recipient, it does the same thing to the recipient’s Address Book. Also, because worms can quickly replicate themselves, they can repeat this scenario over and over. Just the sheer amount of traffic they cause on a network can be enough to bring an entire company to a grinding halt. Worms can also open a “back door” to your system, which enables hackers access to it and gives them the ability to control your computer remotely. Sasser, Blaster, NetSky, and MyDoom are all worms that have created a great deal of trouble in recent years.

Trojan horses are not truly viruses because they do not duplicate themselves or infect other files; however, they can be just as problematic. At first glance, a Trojan horse often appears to be a desirable software program. Perhaps it is a free screensaver program or a set of animated cursors. Unfortunately, these programs come with an unwanted and hidden agenda. After the software is installed, the effects can be similar to those that viruses or worms cause. Before you install new software, it is important to scan the program files with antivirus software to ensure there are no Trojan horses lurking there. And, as with unknown e-mail attachments, it is important to be skeptical about free software—it’s not often that you really get something for nothing!

Spyware

How is spyware different from viruses? Spyware is software designed to capture personal and confidential information that resides on your system and send it elsewhere. It has quickly become as large a problem as viruses. Spyware’s primary threat is to your privacy and confidentiality. Although spyware is not usually intended to harm your system, it can sometimes have that effect on it. Adware is spyware that tracks your Internet browsing and can install malicious cookies on your computer. A cookie is a small text file that contains information that can identify you to a Web site. Cookies are not necessarily bad. They are useful when they are used to help personalize your Web browsing experience, but cookies can threaten your privacy if they are used to reveal too much information.
**How can you tell if spyware is on a computer?**  One symptom that indicates adware is on a computer is an increase in the number of pop-up ads the user receives, some of which might even address the user by name. Adware can generate pop-up ads even when you’re not online. Some types of adware can also reset a Web browser’s home page to a page of its choosing and take control of the search engine, directing you to Web sites that have been predetermined by the adware.

**Are there other privacy threats?**  Key loggers are another type of spyware. In this case, a software program records every keystroke made on the computer. Key loggers can capture all sorts of confidential information this way—passwords, credit card numbers, bank account numbers, and so on—and then relay this information elsewhere. Entire e-mail messages and instant messaging conversations can be recorded this way too. Some key loggers are hardware, rather than software, although they perform the same devious function. Such hardware devices can be attached between the keyboard and the computer. The information stolen through the use of key loggers can easily make you a victim of identity theft. Trojan horses can be used to distribute key loggers and other types of spyware just as easily as they deliver viruses.

**How can you avoid being a victim?**  To minimize the risk of having spyware installed on your computer, there are some practical precautions you can take. One of the most prevalent methods of spreading spyware is through file-sharing services, such as Morpheus or Kazaa. Not only can the file-sharing software include spyware, but often the files you think you are downloading for free are infected too. Although it’s tempting to get the newest song or video for free from such a site, don’t risk it! This problem can be avoided if you use one of the legitimate, pay-as-you-go file-sharing services such as iTunes or the reincarnated Napster. Additionally, be cautious when you download and install freeware or shareware software. Make sure you deal with a reputable software publisher, scan the downloaded software for viruses and spyware, and read the licensing agreement. Some licensing agreements actually include information about additional software that will be automatically installed if you accept it.

Another way to prevent spyware is to avoid pop-up and banner ads whenever possible. You should never click on them. Often the “No Thanks” button is just a ruse to get you to click it and enable the spyware installation. Close pop-up ads by clicking the Close button in the top right corner. Even better, installing pop-up blocking software can help to eliminate this risk almost entirely.

If you are running the most recent version of Windows you already have a pop-up blocker available to you. You can view the pop-up blocker settings for Windows XP in Figure 1.30 and access this dialog box through Internet Explorer’s Tools menu. Many popular search engines, such as Google and Yahoo!, also include pop-up blocking features in their toolbars, which you can download at no charge. It is also wise to avoid questionable Web sites, because some of them can install spyware on your system just by visiting the site.
You can add Web sites to this list that would still be allowed to show pop-ups.

These are sites from which pop-ups are currently allowed.

You can control the level of filtering from High (to block all pop-ups) to Low (to allow pop-ups from secure sites).

### Protecting Yourself and Your Computer

In addition to being cautious in your Internet travels, there are some proactive measures you can take to protect yourself and your computer from viruses and spyware. These include:

- **Software updates and patches**—Keeping your operating system and software up-to-date is critical. Software manufacturers are constantly on the lookout for security threats, and they issue updates and patches to help protect your system. Check for these and install them regularly. Software manufacturers have begun to implement automated procedures to check and install such updates. If your computer has this capability, it’s a good idea to use this feature. Figure 1.31 shows the Windows XP System Properties dialog box, with the Automatic Updates tab open.
• **Antivirus and antispyware software**—Antivirus software is a utility program used to search your hard drive and files for viruses, and remove those that are found. Antispyware software works in a similar fashion, but searches for spyware rather than viruses. No computer should be without this protection. Many users erroneously think that because they aren’t regularly online or use only a slow dial-up connection, they aren’t a target. Nothing could be further from the truth! Recent studies show more than two-thirds of all computer users have some form of virus or spyware on their system.

There are a variety of antivirus and antispyware products available. Unfortunately, there are also a lot of dishonest companies purporting to offer these products. Too often, these are really scams that will actually install spyware or viruses on your system! To avoid being scammed or downloading something malicious, you should never respond to offers that are received in a pop-up ad or unsolicited e-mail. To obtain legitimate products, it is best to purchase them from the manufacturer’s Web site or from a local retailer. Additionally, some Internet Service Providers are beginning to provide some of these products as part of their services.

Some well-known antivirus products include Norton AntiVirus (www.symantec.com), McAfee VirusScan (www.mcafee.com), and AVG Anti-Virus (www.grisoft.com). Antispyware products include eTrust PestPatrol (www.pestpatrol.com), Ad-Aware (www.lavasoft.com), and Spybot Search & Destroy (www.safer-networking.org). You can search for other products at popular download sites such as Download.com (www.download.com) or Tucows (www.tucows.com) but you should be sure to read the software reviews and evaluate their usefulness before downloading or installing them.

It is best to use only one antivirus product, because running more than one can cause conflicts between the programs. However, because there are so many different types of spyware, antispyware products may address these problems in different ways. Experts recommend...
running at least two different antispyware applications in order to catch as many spyware programs as possible. It’s not enough to install antivirus and antispyware software on your system; you need to update it frequently—at least once a week. Doing so will protect you against any new viruses or spyware created since the last time you checked. Software should be set to scan incoming data—files, e-mail, and so on—but regular full-system scans should be conducted on a weekly basis as well.

- **Personal firewalls**—Firewalls may be software programs or hardware devices, although their purpose is the same—to prevent unauthorized access to your computer. When a firewall is installed properly, it can make your computer invisible to hackers and other invaders. Not only can a good firewall help prevent infections and identify theft; it can also prevent hackers from accessing your computer and turning it into a **zombie**. A zombie computer is one that can be controlled remotely and can be used to help spread viruses, spyware, or junk e-mail known as **spam**. Zombie computers can also be used in **denial of service (DoS)** attacks. DoS attacks occur when a large number of computers try to access a Web site at the same time, effectively overloading it and causing it to shut down. If you are using Windows XP or Windows Vista you already have a firewall available to you.

Figure 1.32 shows the Windows XP Firewall dialog box. You can access the firewall settings by clicking Start, and then clicking Control Panel and clicking Windows Security Center. Click Windows Firewall from the Security Center. Note that you can also access Windows Update from this area too.
**What else should I look out for?** It might sound simple, but when online, do not give out personal information unless it is for legitimate purposes. It is important to avoid spam e-mail and *phishing* attacks—e-mails that masquerade as authentic entities such as banks and credit card companies and ask for confidential information. Legitimate organizations will not ask for passwords, bank account numbers, or credit card details through e-mail. It is also possible to check for hoaxes and scams at a variety of Web sites, including many of the antivirus and antispyware sites. When in doubt, do some research to see if the request you’ve received is legitimate. If necessary, make a telephone call to the agency in question. Viewing such requests with a critical eye can help you avoid online scams and hoaxes.
Summary

In this chapter, you examined the benefits of computer fluency and identified the four basic functions of computing. You explored the various types of computers and their components, including CPUs, RAM, and storage devices. This chapter also discussed how to evaluate a computer system and understand the terminology used to measure storage capacity, memory, and microprocessor speed. Various hardware and peripheral devices were reviewed, including input and output devices, and different types of storage media. You explored the basic types of computer software—system software and application software—and the different uses for each type. You identified various types of networks and the different ways networks can be configured. You also reviewed ways to maintain your computer and keep it safe from various threats, including viruses and spyware.

Key Terms

Adware ..................42
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## Key Terms

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## Key Terms

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Content-Based Assessments

Matching

Match each term in the second column with its correct definition in the first column. Write the letter of the term on the blank line in front of the correct definition.

1. Computer programs.
2. Programs that enable you to accomplish tasks and use the computer in a productive manner.
3. Two or more computers connected together to enable resource sharing.
4. Used to manage network resources, this type of computer can be dedicated to a specific task.
5. Floppy disks use this type of storage media.
6. The layout or design/arrangement of computers connected to a network.
7. A peripheral device uses this to attach to the computer.
8. An electronic system that contains input, processing, output, and storage units.
9. The physical components of a computer system.
10. Hardware connected outside the main computer system unit.
11. The hardware unit that contains the CPU, memory, hard disk, and power supply.
12. The unit that contains the circuitry that enables a computer system to operate.
13. The temporary storage available inside the computer.
14. The processing unit.
15. This type of program threatens a user’s privacy.

A Application software
B Computer
C Computer network
D Console/system unit
E CPU
F Hardware
G Magnetic
H Memory (RAM)
I Motherboard/system board
J Peripherals
K Port
L Server
M Software
N Spyware
O Topography
Fill in the Blank

Write the correct word in the space provided.

1. Used to perform complex, dedicated tasks, the _____________ is the fastest and most expensive computer.

2. The four basic functions of a computer are _____________, _____________, _____________, and _____________.

3. Someone with the basic skills and knowledge of a responsible computer user is considered to be computer _____________.

4. Personal digital assistants (PDAs) are also known as _____________ computers.

5. _____________ is data that has been processed and presented in an organized format.

6. The control unit and the arithmetic logic unit are located in the _____________.

7. _____________ measures how quickly the CPU processes data.

8. An object connected to a network is known as a(n) _____________.

9. A(n) _____________ network is often found in homes and allows each node to communicate with all the others.

10. A(n) _____________ records system settings and can be used to roll back a system to an earlier date in case a software installation has unexpected results.

11. When information is displayed on a monitor it is known as _____________ copy.

12. The number of pixels displayed on the screen determines a monitor’s _____________.

13. _____________ printers use a drum and toner in the printing process.

14. The quality of a printed page is measured in dpi, which is an acronym for _____________.

15. The point-and-click format that modern operating systems use is called a(n) _____________.
Content-Based Assessments

Multiple Choice

Circle the letter of the item that correctly answers the question.

1. Which of the following requires one byte of storage?
   a. Page
   b. Paragraph
   c. Sentence
   d. Character

2. Which of the following terms represents the fastest CPU speed?
   a. 733 MHz
   b. 286 MHz
   c. 2 GHz
   d. 2 GB

3. Which of the following is not an input device?
   a. Keyboard
   b. Speaker
   c. Mouse
   d. Stylus

4. Which of the following is an example of optical storage?
   a. Disk drive
   b. Flash card
   c. Memory
   d. Compact disc

5. Which of the following is not a type of computer?
   a. Mainframe
   b. Multitask
   c. Server
   d. Supercomputer

6. Before a computer can process data, where must data be stored?
   a. On a disk
   b. In computer memory
   c. In the control unit
   d. On the monitor
Multiple Choice

7. What term, related to computers, means billions?
   a. Byte
   b. Mega
   c. Giga
   d. Hertz

8. Which of the following is not a type of microcomputer?
   a. Desktop
   b. Notebook
   c. Personal digital assistant
   d. Microprocessor

9. Which of the following can make a computer invisible to hackers?
   a. Disk defragmenter
   b. Antivirus software
   c. Firewall
   d. Key logger

10. Which of the following is capable of opening a “back door” on a computer and is able to spread without human interaction?
    a. Trojan horse
    b. Worm
    c. Adware
    d. Zombie