Chapter 2

Peripheral Devices

What's Inside and on the CD?

This chapter provides an overview of the most popular peripheral devices for personal computers. It begins with standard input devices—your computer’s keyboard and mouse—and then takes a look at some specialized input devices including trackpads, digital cameras, and joysticks. In the FAQs about output devices, you’ll learn about computer display devices and printers. Specialized output devices, such as voice synthesizers and plotters, are also explained.

Peripheral devices can be connected to a computer system in a variety of ways. You’ll find out which technologies provide the easiest connections.

The chapter winds up with an FAQ about purchasing components for a computer system. Handy tips will help you know what to look for when shopping for a computer, software, and peripheral devices.

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FAQ What is a peripheral device?

The term *peripheral device* refers to any input or output component that connects to a computer’s system unit. On a personal computer, standard peripheral devices include a keyboard, mouse, display unit, and printer. A wide variety of specialized peripheral devices for playing games, monitoring home security, capturing video images, and all kinds of other activities are also available for your personal computer. You’ll learn more about personal computer peripheral devices later in the chapter.

Specialized peripheral devices are a key component of many large-scale computer systems. High-speed printers are instrumental in addressing mass-mailing envelopes based on customer lists stored in a database. Mass mailings legitimately assist utility and credit card companies with monthly billing, but unfortunately also generate mountains of junk mail from advertisers and sweepstakes solicitors.

Banks use high-speed optical character readers and other sophisticated imaging peripherals to read and sort millions of paper checks at high speed without halting on creased, torn, or stapled checks. The check amount and account number are read and fed into the bank computer system. Check images generated by any bank can be transmitted to the Federal Reserve and the issuing bank for verification and archiving.

Some manufacturing firms use computer-controlled robots to carry out tasks such as arc welding, circuit board assembly, and painting. These robots, which are often part of an assembly line, can be reprogrammed as necessary to accommodate new and updated products.

Overnight shipping firms, such as UPS and FedEx, use handheld scanning devices to keep track of package deliveries. The shipping label for each package contains a bar code. When a package is delivered, the bar code is scanned and the scanning device automatically adds a date and time stamp. The package recipient’s signature can be collected on a pressure-sensitive input pad, and stored in memory until the driver returns to base and transfers the scanner’s contents to the company’s main computer system.

Retail stores use UPC scanners at staffed and self-checkout lanes (shown in Figure 2-1). As each item is scanned, its price is pulled from the store’s main computer database. At the same time, the inventory count for that item is decreased by one to maintain an up-to-date list of products in stock.

All of these devices—high-speed printers, optical character readers, computer-controlled robots, package scanners, and UPC scanners—can be considered peripheral devices. Although they are not typically part of personal computer systems, these peripherals are important components of large, enterprise computer systems and underscore the key role that digital devices play in business and industry.
**FAQ**

What are the options for standard input devices?

Most personal computer systems include a keyboard and a pointing device for basic data input. These are the tools you use most often when entering data, issuing commands, and manipulating on-screen objects.

The keyboard is the most important input device on desktop and notebook computers, but you can even find tiny keyboards on handheld devices—entering text and numbers is required for just about every computing task. The design of most computer keyboards is based on the typewriter’s QWERTY layout. This unusual arrangement of keys was not designed to maximize typing speed, but to keep a typewriter’s mechanical keys from jamming. Computers inherited this layout because of its familiarity to millions of typists.

In addition to the basic typing keys (Figure 2-2), computer keyboards can include an **editing keypad** with arrow keys to efficiently move the screen-based insertion point. They also include a collection of **function keys** designed for computer-specific tasks, such as putting the computer into sleep mode, adjusting screen brightness, and using a second display screen. Many computer keyboards also include a calculator-style **numeric keypad**.

![Figure 2-2 Keyboard with Function Keys and Arrow Keys](image)

A **pointing device** allows you to manipulate an on-screen pointer and other screen-based graphical controls. The most popular pointing devices for personal computers include mice, trackballs, pointing sticks, trackpads, and joysticks.

A standard desktop computer includes a **mouse** as its primary pointing device. Many computer owners also add a mouse to their notebook computers because it is easier to use than the notebook’s standard trackpad.

![Figure 2-3 Trackpad](image)

A **trackpad** (also called a touchpad) is a pointing device typically built into the system unit of a notebook or netbook computer. The device includes buttons that perform the same functions as mouse buttons. In addition, there is a touch-sensitive pad that can track gestures to move the on-screen pointer up, down, right, or left. Many trackpads have an on/off switch so they can be disabled when a mouse is used (Figure 2-3).
FAQ What are the options for specialized PC input devices?

Personal computers are used in so many activities that most computer owners have at least one specialized input device for playing computer games, taking digital photos, or scanning printed images. Although the variety of input gadgets seems almost endless, the most popular devices are discussed below.

A joystick (left) looks like a small version of a car’s stick shift. Moving the stick provides input to on-screen objects, such as a pointer or a character in a computer game. Joysticks (also called game controllers) can include several sticks and buttons for arcade-like control when playing computer games. Joysticks can also be adapted for use by individuals who have difficulty using a keyboard.

A digital camera (left) is a peripheral device used to capture still images in a digital format that can be easily transferred to a computer and manipulated using graphics software. Digital cameras eliminate film and processing costs. They produce images that can be stored, manipulated, posted on Web sites, and transmitted as e-mail attachments.

A digital video camera (left) captures moving images in a format that can be easily transferred to a computer and manipulated using photo editing software. Digital video eliminates the need for costly editing equipment used to splice film or videotape footage and overlay soundtracks. Using a low-cost digital video camera and entry-level video-editing software, computer owners can produce videos of weddings, vacations, and other significant events. Webcams are a type of inexpensive digital camera that remain tethered to a computer and are used for video conferencing, video chatting, and live Web broadcasts.

A graphics tablet (left) features a pressure-sensitive surface and pen for free-hand drawing. Pressing hard with the pen creates a thick, dark line; light pressure reduces the line width. A digitizing tablet looks similar to a graphics tablet, but can be much larger in size. It is typically used by architects and engineers to transfer points from paper-based drawings into digital format that can be manipulated by computer aided design software.

A trackball (left) looks like a mechanical mouse turned upside down. You use your fingers, thumb, or palm to roll the ball and move the pointer. Onboard buttons work just like mouse buttons for clicking and double-clicking on-screen objects. Trackballs perform the same input functions as a mouse, but require a different set of muscles for their use. Switching periodically between a mouse and trackball can prevent some stress injuries.
What are the options for specialized PC input devices?

A touch-sensitive screen can detect the location of a fingertip or stylus within the screen area. Touching the location of a screen-based icon, for example, can activate a menu or similar control. Touch-sensitive screens are used for tablet computers, PDAs, smartphones, and specialized devices such as information kiosks.

A scanner (Figure 2-5) converts printed images into bitmap graphics that can be viewed and edited with graphics software. Today, scanning technology is built into most multifunction printers. A popular use for scanners is to capture old photographs, store them in digital format, and then use photo editing software to repair cracks, scratches, and fading. A scanner can also be used to capture pages containing text. When scanned as a bitmap, the outcome is similar to taking a photograph of the page; the text becomes part of the page image and cannot be manipulated separately. Some scanners, however, have optical character recognition ability, which converts the letters and symbols on a page into digital data that can be edited using word processing software.

A computer uses a standard microphone to collect audio input. The microphone connector on the system unit is part of the computer’s sound card, which processes audio input into digital format. Some software applications include built-in speech recognition, which allows you to dictate commands and data using a microphone, instead of a keyboard and mouse. Microphones are also handy for annotating e-mail messages and for narrations designed to accompany Web sites and videos. Audio files tend to require lots of storage space, however, so you should refrain from recording long audio segments.

Personal computer peripheral devices also include a variety of sensors, such as water, smoke, and motion detectors used in PC-based home security systems. Security devices, such as fingerprint readers, can be connected to a personal computer to prevent unauthorized access to files and network connections.

Remote controls can also be considered peripheral devices when used to control computer applications. For example, when using a personal computer as the base for a home theater system, a remote control can be used to operate the DVD player and adjust speaker volume.

A variety of input devices have been designed to assist people with physical challenges. Speech recognition systems are useful when keyboarding is not possible. Adaptive devices such as specialized keyboards and head pointers offer other alternatives to a standard keyboard and mouse.
FAQ What are the most popular display technologies?

A computer display device, sometimes referred to as a monitor, is usually classified as an output device because it shows the results of processing tasks. Touch-sensitive screens, however, can be classified as both input and output devices because they accept input and display output. Two technologies are commonly used for computer display devices: LCD and LED. These technologies replace heavy, bulky CRT (cathode ray tube) monitors that used the same technology as old-fashioned televisions.

An LCD (liquid crystal display) produces on-screen images by manipulating light within a layer of liquid crystal cells. Modern LCD technology is compact in size and lightweight, and provides an easy-to-read display. LCDs are standard equipment on notebook computers. Standalone LCDs, referred to as LCD monitors or flat panel displays, are popular for desktop computers. The advantages of LCD monitors include display clarity, low radiation emission, portability, and energy efficiency.

LED (light emitting diode) technology is used for computer displays in two ways. It is most commonly used as backlighting for standard LCD panels. Technically, devices with LED backlighting should be labeled "LED backlit LCD panels," but many manufacturers advertise them as LEDs; so when purchasing a display device, check the fine print. LEDs can also be used in place of LCDs to display the dots of colored light that create a screen image. These true LED screens have a bright, crisp image, and draw less power than LCDs.

The performance of a display device is a factor of screen size, dot pitch, response time, color depth, brightness, and resolution. When selecting a display device, it is important to keep these factors in mind:

• **Screen size** is the measurement in inches from one corner of the screen diagonally across to the opposite corner. Screen sizes for standalone displays range from 13" to 28". Notebook screens are typically 15" to 17". Netbook screens are usually 9" to 10".

• **Dot pitch** (or pixel pitch) is a measure of image clarity. Technically, dot pitch is the distance in millimeters between like-colored pixels—the small dots of light that form an image. A dot pitch between .28 mm and .22 mm is typical for today’s display devices; a smaller dot pitch produces a crisper image.

• **Response time** is the length of time required for a pixel to change color to keep pace with the image being displayed on the screen. For example, when playing an action game, the screen image is constantly changing. A display device with good response time will maintain a crisp image without the appearance of smearing or ghosting. Response time is measured in milliseconds, with lower numbers indicating better response times. Typical response times vary from 6 ms to 2 ms.

• The number of colors a monitor can display is referred to as **color depth** or bit depth. Most PC display devices have the capability to display millions of colors. When set at 24-bit color depth (sometimes called True Color), your PC can display more than 16 million colors and produce what are considered photographic-quality images.
• **What are the most popular display technologies?** (continued)

• Screen brightness can be measured as luminance or as a contrast ratio. **Luminance** is usually expressed in candela per square meter (cd/m²), with higher numbers indicating a brighter display. **Contrast ratio** is the difference between the luminance of white and black pixels. You can adjust a display’s brightness level; but if you plan to use your computer outdoors, make sure the screen has a good brightness rating and contrast ratio.

• The number of horizontal and vertical pixels that a device displays on a screen is referred to as **screen resolution**. The resolution for many early PC displays was referred to as VGA (Video Graphics Array). Higher resolutions were later provided by SVGA (Super VGA), XGA (eXtended Graphics Array), SXGA (Super XGA), and UXGA (Ultra XGA). These resolutions were supplemented by widescreen versions such as WUXGA, indicated by prefixing the acronym with “W.” Today’s 1080i and 1080p display devices typically have 1920 x 1080 resolution, which makes them compatible with widescreen HDTV standards.

In addition to a display device, your computer’s display system also requires graphics circuitry that generates signals for displaying images on the screen. One type of graphics circuitry, referred to as **integrated graphics**, is built into a computer’s system board. Graphics circuitry can also be supplied by a small circuit board called a **graphics card**, like the one in Figure 2-7.

A **graphics card** (also called a graphics board or video card) typically contains a graphics processing unit and special video memory. A **graphics processing unit** (GPU) executes graphics commands, leaving the main processor free for other tasks. **Video memory** stores screen images as they are processed but before they are displayed. A fast GPU and lots of video memory are the keys to lightning-fast screen updating for fast action games, 3D modeling, and graphics-intensive desktop publishing.

Monitors connect to computers using VGA, DVI, or HDMI ports. You can use these ports to connect a second monitor to your netbook, notebook, or desktop computer.
FAQ What are the most popular printer technologies?

Printers are one of the most popular output devices available for personal computers. Today’s best-selling printers typically use ink jet or laser technology.

An ink jet printer has a nozzle-like print head that sprays ink onto paper to form characters and graphics. The print head in a color ink jet printer consists of a series of nozzles, each with its own ink cartridge. Most ink jet printers use CMYK color, which requires only cyan (blue), magenta (pink), yellow, and black inks to create a printout that appears to have thousands of colors. Alternatively, some printers use six ink colors to print midtone shades that create slightly more realistic photographic images.

Ink jet printers, such as the one in Figure 2-8, outsell all other types of printers because they are inexpensive and produce both color and black-and-white printouts. They work well for most home and small business applications. Small, portable ink jet printers meet the needs of many mobile computer owners. Ink jet technology also powers many photo printers, which are optimized to print high-quality images produced by digital cameras and scanners.

A laser printer, such as the one in Figure 2-9, uses the same technology as a photocopier to paint dots of light on a light-sensitive drum. Electrostatically charged ink is applied to the drum and then transferred to paper. Laser technology is more complex than ink jet technology, which accounts for the higher price of laser printers.

A basic laser printer produces only black-and-white printouts. Color laser printers are available, but are somewhat more costly than basic black-and-white models. Laser printers are often the choice for business printers, particularly for applications that produce a high volume of printed material.
• What are the most popular printer technologies?

(continued)

When selecting a printer for your personal computer system, you should consider if its resolution, speed, duty cycle, and operating costs meet your printing needs.

• Printer resolution. The quality or sharpness of printed images and text depends on the printer’s resolution—the density of dots that create an image. Printer resolution is measured by the number of dots per linear inch, abbreviated as dpi. At normal reading distance, a resolution of about 900 dpi appears solid to the human eye, but a close examination reveals a dot pattern. If you want magazine-quality printouts, 900 dpi is sufficient resolution. If you are aiming for resolution similar to expensive coffee-table books, look for printer resolution of 2,400 dpi or higher.

• Print speed. Printer speeds are measured either by pages per minute (ppm) or characters per second (cps). Color printouts typically take longer than black-and-white printouts. Pages that contain mostly text tend to print more rapidly than pages that contain graphics. Typical speeds for personal computer printers range from 6 to 30 pages of text per minute. A full-page 8.5" x 11" photo can take about a minute to print.

• Duty cycle. In addition to printer speed, a printer’s duty cycle determines how many pages a printer is able to churn out. Printer duty cycle is usually measured in pages per month. For example, a personal laser printer has a duty cycle of about 3,000 pages per month—that means roughly 100 pages per day. You wouldn’t want to use it to produce 5,000 campaign brochures for next Monday, but you would find it quite suitable for printing ten copies of a five-page outline for a meeting tomorrow.

• Operating costs. The initial cost of a printer is only one of the expenses associated with printed output. Ink jet printers require frequent replacements of relatively expensive print heads. Laser printers require toner cartridge refills or replacements. When shopping for a printer, you can check online resources to determine how often you can expect to replace printer supplies and how much they are likely to cost.

• Memory. A computer sends data for a printout to the printer along with a set of instructions on how to print that data. Printer Command Language (PCL) is the most widely used language for communication between computers and printers, but PostScript is an alternative printer language preferred by many publishing professionals. The data that arrives at a printer along with its printer language instructions require memory. A large memory capacity is required to print color images and graphics-intensive documents. Some printers accept additional memory, so you might be able to upgrade if your printer requires more memory for the types of documents you typically print.

• Duplex printing. Some printers are capable of printing on both sides of the paper, a feature referred to as duplex printing. The main advantage of duplex printing is cost—you use half the paper required for single-sided printing. Saving paper is also good for the environment; so next time you shop for a printer, consider one that offers the option of duplex printing.

• Networkability. Virtually every business has a computer network, and many households have them, too. Networks allow multiple computers to share a single printer. Any standard printer can be accessed over a network as long as it is connected to a computer on a network that is turned on and allows printer sharing. Some printers, however, contain circuitry that connects directly to a network rather than to a computer. Network circuitry adds to the cost of a printer, but is worth considering if you don’t want to leave one of the computers on your network running all the time.
FAQ What are the options for specialized output devices?

Personal computer owners tend to collect fewer specialized output devices than input devices. Nevertheless, specialized output devices are available.

Many computer owners decide to upgrade their computers’ speaker systems to get better sound quality when listening to digital music and watching digital videos. High-end computer audio systems include surround sound speakers and a subwoofer to blast out mellow bass tones. If you live in an environment where a sound system is not appreciated by your neighbors, you might opt for a set of high-quality earphones, instead.

A plotter is a special type of printer designed to produce line drawings, such as blueprints. Many plotters are designed to produce large-format printouts—some up to six feet wide. Plotters are typically purchased for computer systems owned by architects, engineers, and interior designers.

A voice synthesizer converts digital text into audio output. Many people are familiar with the synthesized voice that narrates weather reports on National Weather Service radio stations. Voice synthesizers are also an integral part of telephone directory assistance and other automated calling systems.

Voice synthesizers are used as adaptive devices on personal computers. They can read the text displayed in a word processor or on a Web page, making these computer services available to people with visual disabilities. For these applications, voice synthesis has a great advantage over recorded audio files because they are generated on-the-fly and can adapt to changes that appear on the screen. Windows includes an application called Narrator (Figure 2-10) that reads the contents of the screen and names screen-based objects as the mouse pointer encounters them.

Computer projection devices are popular with business people, teachers, and students who make lots of presentations. A computer projection device (Figure 2-11) uses digital light processing technology to display a computer-generated image on a large screen. It is the ideal device for delivering PowerPoint presentations to large groups. As an added bonus, these projection devices can be connected to the DVD player in a home theater system.
FAQ How do I connect peripheral devices to my computer?

When you install a peripheral device, you are basically creating a pathway for data to flow between the device and the computer. The channel that transmits data between these devices could be wired or wireless.

Establishing a wired connection between your computer and a peripheral device might be as simple as connecting a cable, or it could require you to install an expansion card inside the computer system unit.

Today, USB (Universal Serial Bus) is the preferred way to connect peripheral devices. On most new computer models, USB ports are conveniently located on the front and sides of the system unit, so that peripherals can be easily connected and disconnected.

Many kinds of peripheral devices, including mice, scanners, and joysticks, are available with USB connections. Several types of storage devices, such as USB flash drives and external hard drives, also use USB connections. Windows automatically recognizes most USB devices, which makes installation simple. If you want to connect more devices than the available number of USB ports, you can use USB hubs. A USB hub is an inexpensive device that turns one USB port into multiple ports. It also saves wear and tear on USB ports caused by repeatedly inserting and removing USB devices. When connecting low-power devices—such as a mouse, keyboard, or flash drive—you can use a bus-powered hub that draws all its power from the computer. For devices such as printers and external hard disk drives that draw more power, a self-powered hub plugs into an external power supply (Figure 2-12).

Most personal computers include a variety of USB ports and other built-in ports for connecting peripheral devices. These ports are pictured in Figure 2-13. When purchasing a peripheral device, read its specifications to determine what type of port it requires. Make sure that you use the right cable and insert it correctly into the port.
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• How do I connect peripheral devices to my computer? (continued)

Establishing a wireless connection between your computer and a peripheral device typically requires some type of transceiver on both devices. A transceiver transmits and receives signals. Those signals could be generated as infrared light, like those used on a television remote control. Signals could also be generated as radio waves by popular wireless technologies, such as Bluetooth and Wi-Fi, that you'll learn about in the Networks chapter.

Wireless peripheral devices typically have a built-in transceiver for a specific wireless technology. Your computer might have a matching built-in wireless transceiver. If not, you can usually connect a transceiver to one of your computer's USB ports.

All PCs have an expansion bus that provides a variety of ways to connect peripheral devices. An expansion bus is an electronic pathway that moves information between the microprocessor and RAM, and stretches to various ports and slots where data can be transferred to other electronic circuitry and devices. In many ways, an expansion bus is analogous to the transit system within an airport that transports people to different airline terminals where they can board flights.

Where the expansion bus leads to connection points that can be accessed outside the system unit, it produces expansion ports, such as USB ports. Connectors inside the case are called expansion slots. Notebook computers typically have one or two internal expansion slots dedicated to expanding RAM. In contrast, desktop computers offer numerous PCI Express (PCIe) expansion slots that can be used for a wide variety of devices, including the souped-up graphics cards that are so prized by computer game enthusiasts. Click the Play It! button in Figure 2-14 to learn how to add expansion cards to a desktop computer.

In addition to a physical or wireless connection, some peripheral devices also require software, called a device driver, to establish communication with a computer. Device drivers are supplied on CDs by the device manufacturer or they can be downloaded from the manufacturer's Web site. If needed, directions for installing the device driver are supplied along with the device. Device drivers work directly with a computer's operating system and they work best when designed for the operating system installed in your computer.

Windows 7 includes built-in device drivers for many peripheral devices. This feature, sometimes called Plug and Play, makes it easy to connect devices without manually installing device drivers. When you connect a new peripheral device, Windows looks for an appropriate built-in driver; if one is not found, you'll be prompted to insert the driver disc supplied by the peripheral device manufacturer.
FAQ How do I select components for my computer system?

Computer technology changes with great frequency. Sorting through computer and peripheral device choices can challenge even the most savvy shopper. The following guidelines should help you navigate through computer, software, and peripheral device purchases.

Consider the tasks for which you’ll use the computer. Begin by making a list of activities you expect to do with your computer system. For example, do you want to use your PC for gaming, word processing, Internet access, graphics, music, or something entirely different? Will you use your computer system for a combination of tasks, or will it be dedicated to one particular task, such as small business accounting? Do you want to use your computer for applications, such as home security monitoring, that might require specialized hardware or software? Does anyone who will use the computer have special needs that might require adaptive devices, such as a voice synthesizer or one-handed keyboard? If you are planning to use specialized peripheral devices or software, check their system requirements to make sure you purchase a computer that supports them.

Determine your budget. Ask yourself how much money you can afford to spend on your new computer. Set a price range and shop for the best computer in that range. As a general rule of thumb, a computer priced higher than US$1,000 is the computer equivalent of a luxury automobile. A computer in this price range contains a fast processor, a generous amount of RAM, and copious amounts of disk space. These computers contain state-of-the-art components and should not have to be replaced as quickly as less expensive computers.

Computers that retail for between US$500 and US$1,000 might be considered the four-door sedans of the computer marketplace because a majority of buyers select computers in this price range. These popular computers lack the flashy specifications of their state-of-the-art cousins, but provide ample computing power for average users.

In the computer industry, the equivalent of a compact car is a sub-US$500 computer. Some netbooks and budget PCs cost as little as US$250. Budget computers do not match the speed, memory size, or disk capacity of more expensive machines. Nevertheless, budget computers feature many of the same components that owners coveted in their state-of-the-art computers a few years back. You might, however, have to replace a budget computer sooner than a more expensive computer.

Select a computer platform. Before you start shopping, you should determine whether you want a Mac or a PC. To make this decision, consider the platform used by the majority of your friends and coworkers. If PCs are the standard platform at work, you should probably purchase a PC for yourself. PCs are the choice of most businesses, except those focused on artistic endeavors, such as advertising agencies. Many elementary schools have standardized on the Mac platform, so if you are a teacher or have children who use Macs at school, that should be your platform of choice.

Choose a desktop, notebook, or tablet configuration. If you want portability, or if you don’t have much desk space, consider a notebook or tablet computer. Otherwise, a desktop computer might fulfill your needs. The features of today’s notebook computers essentially match those of desktop models, but at a somewhat higher price. If you are on a tight budget and don’t require portability, then go for a desktop model. Another reason for selecting a desktop model is the amount of expandability it can provide. If you plan to install lots of peripherals, you want an ergonomically designed keyboard, and you prefer a large screen display device, you might not be happy with a notebook computer.
Select processor type and speed. Even after you’ve identified a brand and model, you might have a choice of microprocessors. Processor speed directly affects computer performance. A fast processor is essential for some applications such as desktop publishing, video editing, and serious computer gaming. The fastest processors are expensive, however, and unnecessary for most routine computing tasks.

Select an operating system. Macintosh computers are shipped with the current version of Mac OS, but you can add Windows to an Intel Mac computer using software such as Boot Camp or Parallels. PCs can be shipped with Windows or Linux, but that choice is typically easy to make. Linux would be the operating system of choice if you plan to operate a network or Web server. For the typical personal computer system, Linux limits your choice of software applications and might not provide device drivers for some of the peripheral devices you want to install. PC buyers typically choose the Windows operating system because of its flexibility and because it is the PC standard.

When you purchase a PC, you might have a choice of Windows versions. Microsoft typically offers Windows in Home versions and Professional versions. The Professional versions provide some enhanced security and networking options not available on Home versions. Unless you plan to operate a small business network, Home versions should be sufficient for your needs.

Regardless of the operating system you select, make sure it is the most recent version. Older operating systems might not support the newest software applications or some new peripheral devices.

Consider your storage needs. A hard disk serves as the main storage device for your computer. Most of today’s computers offer at least 250 GB of hard disk space. That amount should be sufficient for most personal computer owners. Music, video, and graphics files are large; so if you plan to store many of these files, you might want to upgrade to a larger hard disk.

Your computer should include an optical drive for making backups and installing software from distribution disks. Netbooks, however, typically don’t have enough room in the system unit for an optical drive, so you might want to purchase an external optical drive that connects to your netbook with a USB cable.

Consider RAM and video memory capacity. Today’s computers include at least 2 GB of RAM. Lots of RAM capacity is better for memory-intensive applications such as desktop publishing and video editing. Additional RAM raises the price of a computer. If you are on a tight budget, remember that you can add RAM later if your applications demand it.

If you intend to use your computer for 3D action games, video editing, or desktop publishing, you’ll want high-performance graphics components. On some computers, the graphics card circuitry is built into the motherboard and a section of RAM handles graphics-related tasks. This technology, usually referred to as shared memory (or integrated graphics), does not match the performance of a dedicated graphics card and video memory. Look for dedicated graphics and at least 1 GB of video memory if you plan to tackle serious graphics applications.
• How do I select components for my computer system?
(continued)

Evaluate the computer’s upgradeability. Some computers are easier than others to expand and upgrade. As a rule of thumb, desktop models are easier to upgrade than notebooks, which often contain specialized components designed to fit in a small system unit. If you want expandability, look for open drive bays that can hold additional hard disk, CD, and DVD drives. Ask about the number of expansion slots provided for network, video, and audio expansion cards. Also, look at the position and number of ports for connecting peripheral devices. Multiple USB ports are handy—especially if they are easily accessible.

Select software. Most computers are shipped with the operating system preinstalled. Remember that Windows includes several utilities and applications, such as rudimentary graphics, compression, backup, defragmentation, Web browsing, and e-mail software. Many computer vendors also install a “bundle” of application software packages. A typical software bundle includes word processing, spreadsheet, presentation, and antivirus software. This software is handy for just about everyone, and computer buyers can typically save money by purchasing a bundle along with a new PC. Some of the software bundled with a PC is typically trial software that you can use without charge for a short period of time, but have to pay to use after the trial period ends. Make sure you understand if an application is trialware. If you don’t pay when the trial period ends, you could lose access to data files that you created when using it.

Select peripheral devices and accessories. Always find out what is included in the price of a computer system, and carefully consider whether each device will be useful for your computing projects. Low-cost desktop computers might not include display devices. After factoring in the price of a display device, these systems might not be such a good deal. In contrast, some vendors offer special hardware bundles that include an LCD display, printer, PDA, and digital camera. When purchasing a notebook computer, you should consider buying an extra battery, carrying case, A/C adapter for using an electrical wall outlet, and D/C adapter for in-car use. Because many of these accessories are designed specifically for a particular notebook model, they might not be available in a year or two.

Evaluate manufacturer and vendor support and warranty. When you encounter hardware and software problems, you want them fixed as quickly as possible. Technical support and repair service is usually available from the company that manufactured the equipment or published the software. Support and service might also be available from the merchant or vendor. Before you make a final decision on computer equipment or software, ask the following questions: Does the price of the equipment or software include technical support? How long does the support last? How can you contact technical support? Is it free? Is the support staff knowledgeable? What is the duration of the equipment warranty? Does it cover the cost of parts and labor? Where do repairs take place and is there a shipping cost? How long do repairs typically take?

Shopping for computer equipment and software can be a challenge; but if you take a careful, organized approach, you can usually buy with confidence. Remember to use all available resources, such as vendor Web sites, magazine reviews, and recommendations from friends and experts.
QuickCheck A

1. A(n) ________ converts printed images into bitmap graphics that can be viewed and edited with graphics software.

2. A(n) ________ screen is standard equipment on most notebook computers and is the technology used for most of today’s standalone display devices.

3. A graphics card typically contains special video ________, which stores screen images as they are processed, but before they are displayed.

4. True or false? Today, USB (Universal Serial Bus) is the preferred way to connect peripheral devices. ________

5. True or false? As a general rule of thumb, a computer priced higher than US$750 is the computer equivalent of a luxury automobile. ________

QuickCheck B

Enter Y for the ports that are shown in the photo, enter N if the port is not shown in the photo.

1. USB port ________
2. Display port ________
3. Network port ________
4. Audio port ________
5. FireWire port ________