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1. COMPUTER HARDWARE & SOFTWARE

1.1. HARDWARE

Hardware refers to all the pieces of physical equipment that make up a computer system. The computer hardware you are most familiar with is probably the *personal computer* or *PC*.

A PC includes several pieces of hardware or devices.

The *power supply* is a device that distributes electricity to the various components of the system. The electrical cord runs from the power supply to the electrical outlet. The power supply also includes a fan that cools the internal components.

The *motherboard* is the largest circuit board inside your personal computer. It contains millions of electronic components on silicon chips. These chips store programmed instructions in active memory (see next page for RAM). They also execute the instructions stored in other chips. The motherboard has expansion sockets or slots (known as the bus, see next page). These slots enable the installation of add-on boards.

The motherboard has some specialty ROM (Read-Only Memory) chips that contain the BIOS (Basic Input/Output System). The BIOS checks your computer's components and causes the operating system to start.

To work properly, the BIOS needs to know the configuration of your computer's hardware. This hardware information is stored in the *CMOS* (Complementary Metal Oxide Semiconductor) — a chip with configuration controlled by the setup program. The CMOS provides information on the following components:

- ▶ system date and time,
- ▶ mouse,
- ▶ keyboard,

- ▶ hard drive (number and capacity of the drives),
- ▶ DVD±R/RW drive.

The settings are permanently saved in a 64-byte piece of CMOS. A small battery supplies the CMOS power; therefore, its contents are not lost when the PC is turned off.

The CPU (Central Processing Unit) is a chip located on the motherboard which performs mathematical calculations and logic functions (determining if one value is greater than another, and so on). The CPU is often referred to as the brain of a computer since it administers the functions of the other components. When the users say their machine has a Core 2 Duo processor, they are talking about the CPU chip.

The bus is the main communication path, or series of paths, on the motherboard that connects the system's components with the CPU. The bus also connects external components via expansion slots. These slots may contain plug-in cards that let the computer communicate with other devices, such as monitors and printers.

RAM (Random Access Memory), special chips connected to the CPU, is the area where programs and data are found while in use. When you run an application (Microsoft Word, for example), the computer stores the program in RAM. If you then open the document, the machine will also upload it into RAM. When you save the document, the CPU copies it from RAM to the persistent store. When you close the document, the CPU deallocates the memory that was captured. When you close the program down, the storage is also released. RAM holds data only until the power is off. At shut down or power loss, information in RAM is lost. Hence, any changes not saved before the machine is switched off cannot be restored. In modern PCs, RAM capacity is measured in gigabytes. In general, the more RAM your computer has, the better it is capable of running programs that require processing power.

A *peripheral* is a device plugged into the computer via the bus. Many major components of a PC system are peripherals including monitors, keyboards, and disk drives. Printers and scanners are also peripherals.

Some peripherals because of their small size or delicate nature are mounted directly inside the computer case. Video boards, internal mo-

dems, and sound cards are devices inside the computer that depend on the bus.

Peripherals are often divided into two categories — *input devices* and *output devices*. Some peripherals serve as both input and output devices; for this reason, the categories are not exclusive. Some common peripherals and their functions are described below.

The *monitor* is an output device that displays input and the results of processing. Most monitors on PCs and laptops use liquid crystal display (LCD) technology, similar to that applied in some television sets. In fact, some computers use TV sets as monitors.

The *mouse* is an input device that you use to control a pointer displayed on the monitor. There is a wide variety of mouse pointing devices. Some are moved over a surface and may be wireless; some let you use your thumb or fingers to roll a ball that moves the pointer; others, especially on laptop computers, operate when you drag your finger across a small screen called a touch pad.

The *keyboard* is an input device with alphabetic, numeric, and function keys with the standard layout. Some keyboards rearrange particular keys and have keys that other keyboards may be missing. The special keys (such as Fn (Function), Ctrl (Control), and Alt keys) are used either separately or in combination to cause programs to perform actions.

Most computers contain a *hard disk* (or hard drive) and *optical drive*, such as a DVD drive. DVDs can be removed and carried over from one place to another; hard disks are installed inside the computer and are not considered portable. Disk drives are identified by a letter. The typical personal computer has an optical drive identified as D:. It probably also has a hard drive known as C:. Hard disks, DVDs, and drives are both input and output devices.

Modems and other telecommunication facilities (when used with appropriate software) serve as sources of both input and output. Telecommunication gives you access to the world outside your personal computer — to such services as MSN and that vast network of computers known as the Internet or World Wide Web. A modem is installed inside the computer case (an internal modem), or it is connected via a communications port (an external modem).

Printers, next to monitors and disk drives, are the most common output devices. A wide variety of printer types is available:

- ▶ laser printers use copier-like technology to spread patterns of toner and affix them to paper using heat;
- ▶ ink jet and bubble jet printers spray the ink onto paper to produce the output;
- ▶ plotters use a pen to draw on paper; engineers and architects frequently use them to create schematic drawings.

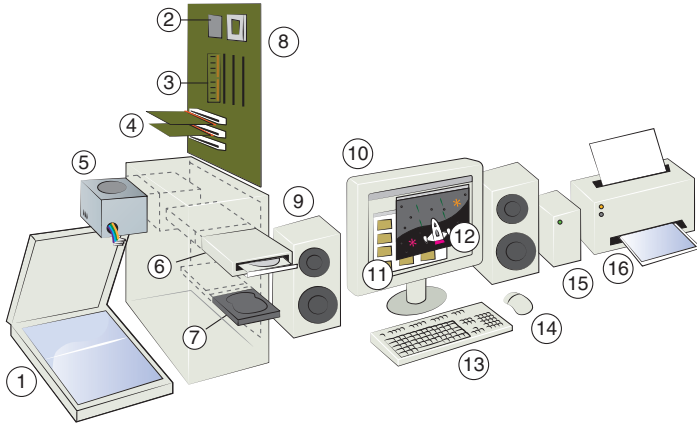
Scanners that enable you to create files from pictures, drawings, or text are input devices.

Voice input devices (microphones) are becoming more common as hardware and software manufacturers improve their efficiency.

Key terms	
<p>BIOS The basic input-output system is the component that checks your computer's components and causes the operating system to start.</p> <p>CMOS A complementary Metal Oxide Semiconductor is a chip with configuration controlled by a setup program.</p> <p>CPU The Central Processing Unit is a chip located on the motherboard which performs mathematical calculations and logic functions.</p> <p>Hardware Refers to all the pieces of physical equipment that make up a computer system.</p>	<p>Monitor An output device that displays input and the results of processing.</p> <p>Motherboard The largest circuit board inside your personal computer.</p> <p>Peripheral A device connected to the computer via the bus.</p> <p>Power supply A device that distributes electricity to the various components of the system.</p> <p>RAM Special chips connected to the CPU, the area where programs and data are found while in use.</p> <p>ROM Read-Only Memory chips that contain the BIOS (Basic Input/Output System)</p>

Task 1

Give names to all the numbered hardware components:



Task 2

Match each item with its function.

1. Video card	a) Section that holds programs and data while they are executed or processed
2. Keyboard	b) Provides sound output
3. Monitor	c) Allows images to be displayed on a screen
4. Speaker	d) holds data read or written to it by the processor
5. Main memory	e) Displays computer output on a screen
6. RAM	f) Controls operations on all parts of the computer
7. Processor	g) Inputs data through keys like a typewriter
8. Ports	h) sockets into which an external device may be connected

Task 3

Classify the table below into *three types* — Storage Devices, Input Devices, and Output Devices.

Main components of a computer	Multimedia devices	Other peripheral devices
1) Touch pad 2) Monitor	1) Speakers 2) Headphones	1) Printer 2) Scanner

Main components of a computer	Multimedia devices	Other peripheral devices
3) Hard disk/hard drive 4) Keyboard 5) Mouse/trackball 6) CD-ROM drive 7) Solid-state drive (SSD)	3) Microphone 4) Blue-ray disk	3) Joystick 4) USB flash drive 5) Webcam 6) Digital camera

Storage Devices	Input Devices	Output Devices

1.2. COMPUTER SOFTWARE

Software refers to the instructions that allow a computer to run and operate data entry. Software is usually divided into two types: system software and application software.

System software consists of the programs that control or maintain the operations of the computer and its devices. System software serves as the interface between the user, the application software, and the computer's hardware.

There are three basic types of system software.

1. An *operating system (OS)* is a set of programs that coordinates all the activities between computer hardware devices. The operating system manages various hardware components including the CPU, memory, storage devices, and peripheral devices. It also coordinates with the various software applications that might be running.

Although the operating system communicates with the computer and its peripherals, it also includes a user interface designed 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 expected results. As you can imagine, a system of this type was not very user-friendly. Most modern operating systems apply point-and-click format known as *graphical user interface (GUI)*. GUIs are more user-friendly and intuitive than DOS systems. Rather than typing specific commands, you can operate 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.

2. *Utility program* allows the user to perform maintenance-type tasks usually related to managing a computer, its devices, or programs. Utility programs can be used to help back up important files, erase unwanted files or uninstall programs from your system, and schedule various tasks to keep your system running smoothly. Some of these utilities are implemented in the operating system (Disk Cleanup, Disk Defragmenter, etc.), whereas the others are stand-alone versions that you can purchase or download for free.
3. *Language translator* is used to translating the programs written in assembler and high-level language to the machine language. The conversion of assembler and high-level language programs into machine language by means of language translators makes the programs machine readable for execution. The main language translators are the assembler, interpreter, and compiler.

Application software is a computer program designed to perform a group of coordinated functions, tasks, or activities for the user's benefit.

Application software depends on the operating system. It uses operating system — specific instructions to tell the operating system to do something. Since application software interacts with the operating system, so applications designed for one operating system (Windows, for example) cannot run on a different operating system (Unix or Mac OS, for instance).

Application software can be broadly classified into two types: (a) Generalized packages and (b) Customized packages.

Generalized Packages These are user-friendly software written to cater to user's very general needs such as preparing documents, drawing pictures, establishing databases to manage data/information, creating presentations, playing games, etc. It is a group of programs that provide general-purpose tools to solve specific problems. Some generalized packages are listed below:

- ▶ Word Processing Software (for preparing documents): MS Word, OpenOffice.org Writer;

- ▶ Spreadsheets (Data Analysis): Lotus Smart suites, MS Excel, OpenOffice.org Calc, Apple Numbers;
- ▶ Presentations: Presentation Graphics, MS PowerPoint, OpenOffice.org Impress;
- ▶ Database Management Systems: MS Access, OpenOffice.org Base, MS SQLServer, ORACLE;
- ▶ Graphics Tools: Paint shop pro, Adobe Photoshop.

Customized Packages These are the applications that are customized (or developed) to meet specific requirements of the organization/institution, for example, Student information details, Payroll packages, inventory control, etc. These packages are designed using high-level computer language.

Some application software is preinstalled on new computers. You can also obtain multiple versions of additional software.

Companies own the copyrights to the application software they sell to the public. This prevents you from illegally copying it with the aim of selling, giving away, or sharing it. *Commercial software* is copyrighted software that requires purchasing prior to use.

Some companies distribute their copyrighted software free of charge. This is known as *freeware*. The companies allow users to install the program as long as they do not resell it to other people.

On occasion, program developers allow you to use programs, share, give them away, or even modify them to meet certain needs. This is called *public domain software*. Beware, the quality of these programs may be largely different and contain more errors than other types of software.

1.3. MICROSOFT WINDOWS OS

Microsoft Windows, generally referred to as Windows, is an operating system based on a GUI (Graphical User Interface). That means it implements WIMP (windows, icons, menus, and pointing devices) to facilitate the use of the operating system. Windows is a multi-tasking operating system — a single user can run multiple programs concurrently. The programs share the Central Processing Unit (CPU) resources. As with all operating systems, the Windows Operating System (OS) controls all input, processing, and output.

Windows OS comes with several accessories, built-in programs that are extremely useful for completing everyday tasks.

Notepad (*Блокнот*) is a plain text editor you can use to view and create unformatted text (.txt) files. If you double-click a text file in Windows Explorer, Notepad will likely open and display the file. If a line of text is too long to display without scrolling, click Format (*Формат*) and Word Wrap (*Перенос по словам*). To create a file, simply start typing in the Notepad window, click the File menu and Save (*Файл — Сохранить*). Before printing a file, click File; click Page Setup; select the paper orientation, margins, header, and footer.

The Calculator (*Калькулятор*) started from Accessories has four alternative calculators, each with its own view:

- ▶ standard desktop calculator (*обычный*);
- ▶ scientific calculator (*инженерный*) shown in Fig. 1.1;
- ▶ programmer calculator (*программист*);
- ▶ statistics calculator (*статистика*).

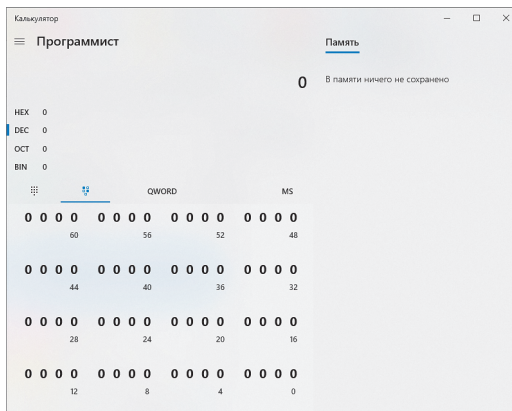


Fig. 1.1. View of the scientific calculator

The unit converter, the date calculator, and four worksheets for calculating a mortgage, vehicle lease, and fuel economy in both mpg and L/100 km are included as extensions to the current view. To switch from one view to another, click View and click the other view. To use

the calculator, click numbers on the screen or type them on the keyboard.

Paint lets you view, create, and edit bitmap image files with .bmp, .dib, .gif, .ico, .jpg, .png, and .tif extension. Several drawing tools and set of colors are available to create simple drawings and illustrations (see Fig. 1.2).

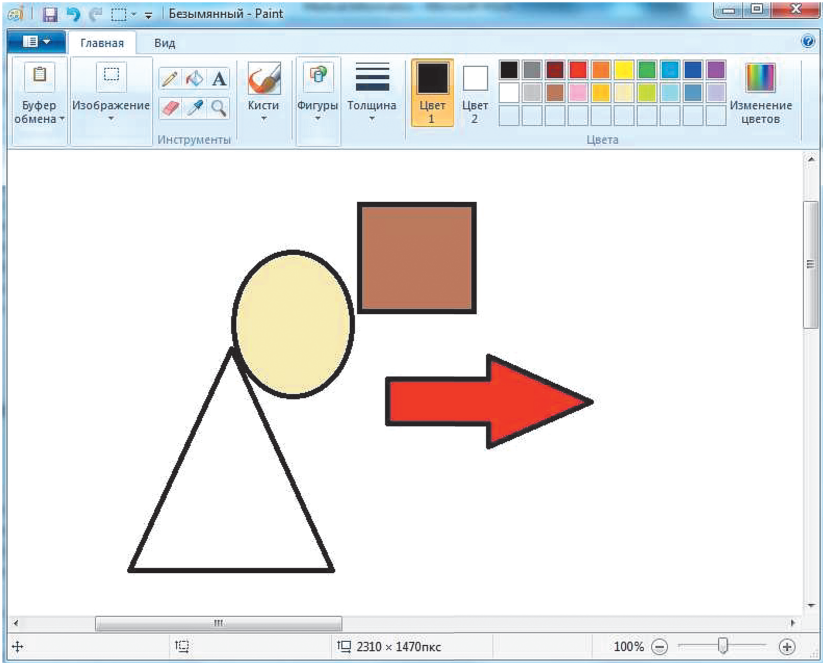


Fig. 1.2. The Paint window

Command prompt (*Командная строка*): Testing a Network Setup and Connection (see Fig. 1.3).

You can use several command-line utilities to test the TCP/IP installation. The most useful of these commands are:

- ▶ ipconfig is used to determine if the network configuration has been initialized and the IP address is assigned. If the IP address and valid subnet mask are returned, the configuration is initialized,

and there are no duplicates for the IP address. If a subnet mask of 0.0.0.0 is returned, the IP address is a duplicate;

- ▶ *Hostname* is used to determine the machine name of the local computer.

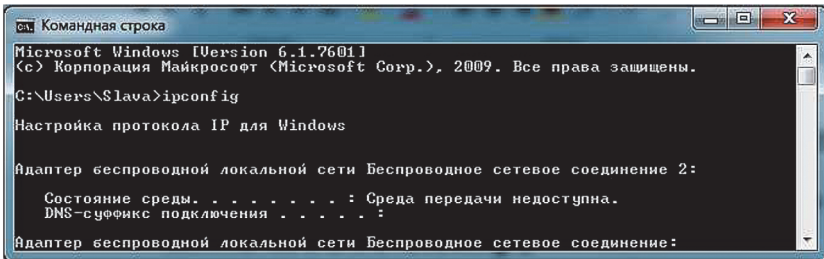


Fig. 1.3. The command prompt window

Key Terms	
<p>Application The term application comes from the idea that a group of programs works together to apply computing power to a specific task, such as word processing or weather forecasting.</p> <p>Application software It is a set of programs that are written to perform specific tasks.</p> <p>Commercial software It is copyrighted software that requires purchasing before use.</p> <p>Graphical user interface (GUI) It is a type of user interface that allows users to interact with electronic devices by means of graphic icons and visual indicators such as secondary notation instead of text-based user interfaces, typed command labels, or text navigation</p>	<p>Operating system It is a system software that provides the interface for the user to communicate with the computer, manages hardware devices (disk drives, keyboard, monitor, etc.), controls and maintains disk file systems, and supports application programs.</p> <p>System software It is computer software designed to provide services to other software.</p> <p>Utility program It is system software developed to help analyze, configure, optimize, or maintain the computer.</p> <p>Windows OS It is a meta-family of graphical operating systems developed, marketed, and sold by Microsoft</p>