

Министерство образования Республики Беларусь
Учреждение образования
БЕЛОРУССКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
ИНФОРМАТИКИ И РАДИОЭЛЕКТРОНИКИ

Кафедра иностранных языков №2

Readings in Computer Science
Teaching Aid for Computer Students

Методическое пособие
по просмотровому чтению
на английском языке
для студентов 2-го курса ФКСиС и ФИТиУ

МИНСК 2002

УДК 802.0 (075)

ББК 81.432.1я7

М 54

Авторы: И.Г.Субботкина, Ю.М.Василенко, Н.Г.Касперович,
А.И.Рогачевская

Методическое пособие по просмотровому чтению на
М 54 английском языке для студентов 2-го курса ФКСиС и ФИТиУ
И.Г.Субботкина, Ю.М.Василенко, И.Г.Касперович, А.И.Рогачевская. –
Мн.: БГУИР, 2002. – 39 с.

ISBN 985-444-404-X

Методическое пособие предназначено для студентов 1-2-го
этапов обучения. Содержит оригинальные тексты по вычислительной
технике. Цель пособия — развить навыки чтения, понимания и
реферирования текстов, увеличить лексический словарь, а также развить
навыки профессионально-ориентированной устной речи.

УДК 802.0 (075)

ББК 81.432.1я7

ISBN 985-444-404-X

© Коллектив авторов, 2002

© БГУИР, 2002

UNIT 1 How Computers Store Data

1. Read the text and speak about the major disadvantage of magnetic tape.

Traditional Storage – Magnetic Tape

Magnetic tape is one of the oldest forms of computer storage. First- and second-generation computers used magnetic tape for most of their storage needs. Today, magnetic tape is not used as often.

Magnetic tape storage devices work in much the same way that a tape recorder works. Instead of play and record, the terms read and write are used. The magnetic tape used by a computer is very much like the tape used on an audio tape recorder. Most mainframe computers use reel-to-reel tapes, minicomputers use cartridges (similar to a VCR tape), and microcomputers use cassettes. Like the tape used in a tape recorder, computer tape can access what is stored on it only in the order in which the data was recorded (sequentially). This limited sequential access, which slows down data access, is such a significant disadvantage that tape is used primarily to back up data that is also stored on disk or that will not be needed frequently.

There are some good reasons to use magnetic tape, despite the disadvantages mentioned. Tapes can be recorded, erased, and reused many times, and they are inexpensive. Tapes are easily transported from one location to another, and tape drives can store large amounts of data quickly. Magnetic tape capacity is measured in bytes per inch (bpi), known as the tape density. Low-density tapes generally store 1,600 bpi, and high-density tapes can store 6,250 bpi. The newest tapes, called R-DATs, can store more than 14 gigabytes on a single 90-meter tape. The speed, storage capability, and cost of tape are reasons why it is still frequently used as a backup medium.

2. Read the text and describe how a magnetic disc stores data.

Today's Preferred Storage – Magnetic Disk

Disk drives can store large amounts of data and have the capability to directly access a file or record. A magnetic disk, coupled with a disk drive that can store and retrieve data on the disk, is a random-access storage medium; that is, if you need the 157th item, the drive head can go directly to that item and read it. The disk drive's magnetic head is called a read/write head. When you insert a disk into the disk drive, the disk fits on a rod that rotates the disk. The read/write head reads the magnetic impulses. It can move laterally above the surface of the disk, just as you would move a phonograph's arm to locate a specific track on an LP record. A different read/write head is used for each surface of each platter in a disk pack. All the read/write heads are mounted on a single arm, so that each head reads the same track and sector on its platter at the same time. It is important to remember that disk drives are mechanical devices. Problems can occur, so backup copies of important programs and data are essential.

Before a disk can be used for storage, it must be prepared by means of a process called **formatting**. In this process, the disk drive's read/write head lays down a magnetic pattern on the disk's surface. This pattern enables the disk drive to store data in an organized manner. Formatting is one of the basic tasks handled by the computer's operating system.

Data is recorded on disk in concentric circular bands called **tracks**. The tracks on a disk are similar to the grooves on a phonograph record. Each track is divided into pie-shaped wedges called **sectors**. Two or more sectors combine to form a **cluster**.

Most computers maintain on the disk a table with the sector and track locations of data. This table, the **file allocation table (FAT)**, enables the computer to locate data easily. There are two popular types of magnetic disk: floppy disk and hard disk. Most of today's personal computers are equipped with both.

3. Read the text and briefly speak about two popular types of magnetic disk.

Floppy Disks and Disk Drives

A **floppy disk** is a flexible circle of mylar plastic. The 5.25-inch version is encased in a square jacket that is harder than the disk itself but is still flexible. The 3.5-inch disk is a newer design than the 5.25-inch disk, which is rapidly disappearing.

Most personal computers are equipped with one or two operations: read and write. A read operation is similar to playing a CD-ROM. The drive "plays" information from the disk and relays it to the processor. A write operation is similar to recording on a cassette tape. The drive records information on the disk. Unlike operating a cassette recorder, though, you don't have to push buttons; these actions occur under the direction of the program you are using. Disks contain a write-protection tab that you can open to protect data from being overwritten or deleted.

The amount of information that can be stored on a floppy disk is determined by the density of the magnetic particles on the disk's surface. Double-density disks store more than the single-density disks of a decade ago, but high-density disks are increasingly common today.

Disks are inexpensive. The storage capacity of floppy disks is relatively limited. In addition, because floppy disks spin only about 300 revolutions per minute, locating data (seek time), waiting for the disk to spin to the correct sector (rotational delay time), and transferring the data to primary memory (data transfer time) takes a comparatively long time. (The combination of seek time, rotational delay time, and transfer time is known as the access time.) For this reason, all new personal computer systems are equipped with hard disks, which have much more storage and operate considerably faster.

4. Read the text and list some features of hard disks.

Hard Disks

A hard disk works similarly to a floppy disk, but the hard disk is made of rigid metallic

platters, can hold much more data, and operates much faster. Most hard disks are permanently encased in the disk drive, although some drives use removable cartridges. Removable disks, generally known as Bernoulli disks, consist of a single platter encased in a plastic cartridge. A hard disk pack, which is usually found in a desktop computer (or larger), consists of several platters, with data encoded on both sides of each platter. All tracks and sectors in the same relative location on a disk pack form a cylinder. (For example, track 20 sector 2 on platter 1 and track 20 sector 2 on all the other platters in the disk pack form a cylinder.) Many small disk notebook computers use a hard card, which is a small disk mounted on an expansion card, rather than a full disk drive and pack.

Hard disks spin so rapidly that the read/write head does not touch the surface of the disk. Serious damage can be caused if the read/write head encounters an obstacle, such as dust or smoke particle causing the read/write head to bounce on the disk surface.

Why do hard disks perform so much better than floppy disks and floppy disk drives? There are several reasons:

- A single hard drive may have several platters, providing large data storage capacities.
- Most hard disks are permanently encased within the disk drive in a sealed environment free from dust and dirt. The disk can spin very rapidly, with the read/write head “floating” above the disk’s surface.
- Hard disks spin at an average of 3,600 revolutions per minute, making data retrieval very fast.

Intense competition and technological innovation are driving hard disk prices down, even as storage capacities rise. Many personal computers have hard disks capable of storing a gigabyte – one billion characters – or more.

As the space required for software increases so will the size of the hard drives. Six gigabytes is a good estimate to consider. It provides enough room to grow over the next few years. It may seem like a lot, but many PC enthusiasts will tell you that you can never have enough space.

Larger computer systems are beginning to use a new type of hard disk storage. A **RAID (Redundant Array of Inexpensive Disks)** can be composed of more than one hundred 5.25-inch disks with a controller mounted in a single box. RAID storage first appeared on the market in 1993. A RAID can send data simultaneously over multiple data paths quickly.

5. Read the text and describe the major advantage of removable storage.

Removable Storage

One of the most significant new developments in personal computers has been the advancement of removable storage. Disks and backup tapes were, until recently, the only options. Iomega’s zip drive uses disks that resemble the typical 3.5-inch 1.44M (megabytes) version but with a capacity of 100M. These disks are frequently used as an alternative to tape drives for archiving, but their real advantage is in providing a way of

transporting large amounts of data (such as transporting data between home and office or to a customer site or for mailing). The drives can be internal or external. Zip disks, a bit thicker than a regular floppy, have the capacity of 70 regular disks. Jaz drives are to zip drives what a hard drive is to a disk and offer storage in the range of 1G. If you like to keep a close eye on hardware trends, Web sites such as CNET have up-to-the-minute reports in computer hardware news.

Zip drives are not to be confused with **zip files**. Zip files are created by compression software, such as PKZip or WinZip. Many files can be contained within a single zip file, which must also be decompressed by software.

Another major advancement in removable storage is the **nest bay**. The nest is installed in a regular 5.25-inch drive bay and accommodates several types of storage. You can insert and remove hard disk, tape, CD-ROM, zip, and Jaz drives as you need them, or transfer them between different machines.

6. Read the text and explain how computer files are organized on CD-ROM.

The Storage of the Future – Optical Disk

CD-ROM works much like the compact disks used in CD players. Just as CDs have revolutionized the music industry, optical disks have the potential to change secondary storage media. Based on the same laser technology as CDs, optical disks offer a medium capable of storing extremely large amounts of data. The three main types of optical disk are CD-ROM, WORM CD, and MO technology.

The most popular and least expensive type of optical disk is **Compact Disk Read-Only Memory (CD-ROM)**. As the name indicates, these disks come prerecorded and cannot be altered; CD-ROM is, in other words, a read-only storage medium. Still, CD-ROM provides an excellent way to distribute large amounts of data at low cost. CDs can store up to 650M of data, yet they can cost as little as a dollar per disk to duplicate in massive quantities.

To use a CD-ROM, you must have a computer equipped with a **CD-ROM drive**. CD-ROM towers, containing as many as 256 CD-ROM drives, are frequently attached to CD servers so that all the computers on a network can share what is stored on the CD-ROMs.

CD-ROM has been used primarily to market large applications. For example, *Infopedia* is a single CD that holds a complete encyclopedia, dictionary, thesaurus, world atlas, dictionary of quotations, world almanac, and biographical dictionary. The *Total Baseball* CD holds statistics on over 13,000 players with photographs of their trading cards and explanatory sound clips. You can tour the National Art Gallery on CD-ROM or play a variety of games.

Consumers will hear more and more about what is known as DVD. DVD has stood for both digital video disk and digital versatile disk, depending on which manufacturer provides the information. The most important thing to realize about a DBED is that it is the same size as a CD-ROM but offers seven times the storage capacity. DVD disks can hold full-motion video, including your favorite full-length feature film. DVD drives can

read CD-ROMs, but they are much slower than the latest CD-ROM drives. Current CD-ROM drives are 24X, but DVD drives are currently only 10X.

A **Write Once, Read Many Compact Disc (WORM CD)** is purchased blank from the manufacturer and encoded using special equipment. The disks can't be altered after they are encoded and can't be easily duplicated because the encoding process does not actually pit the disk. Many businesses use WORM CDs to store old data files. This practice, known as archiving, enables old files to be deleted from the hard disk, thus freeing space for new files. WORM CDs are used most frequently for document processing with complete image processing, including replications of photos, graphics, text, and even signatures.

Until recently, recording on a CD-ROM required separate, very expensive equipment. Now drives that can write to and read a CD, called **CD-Recordable (CD-R)** drives, are available for less than \$200, and prices are going down rapidly. A blank disk costs about \$15. CD-R is a WORM process. The disks can be read by any standard CD-ROM unit.

If you want to create a multimedia presentation and then play it back on any available computer equipped with a CD-ROM drive, CD-R is the tool you have been looking for. With the large capacity of CD-R (roughly 600 megabytes per disk), you can create and store an entire multimedia presentation on a single disk. (Floppy disks don't have this capacity.)

CD-Rs look like standard CD-ROMs except that they are gold in color, rather than the silver of "mastered" CD-ROMs. The blank disks are made with the spiral tracks impressed on the recording surface. Because CD-ROMs are read by refraction of light, a dye layer is discolored in the recording process, which causes the area either to reflect light or to disperse it.

The technology to make **CD-Erasable (CD-E)** disks recently became available. CD-E enables users to store, access, and reuse disks in the same way that floppy disks can be used. Because of the large storage capacity of CDs, they will likely make magnetic tape, and perhaps floppy disks, a thing of the past.

Magneto-optical (MO) disks are erasable and combine the magnetic principles used on tape and disk with new optical technology. MO disks measure storage capacity in gigabytes; they are removable, portable, and durable. One of the newest MO systems – Orray produced by Pinnacle Micro – uses a storage method similar to that of RAID. Optical disks have a thirty-year shelf life and are ideal for graphics and audiovisual applications that require large storage capacity.

7. Read the text and describe several types of data files.

Storing Data in Files

No matter what storage medium or computer you are working with, everything stored on it is stored in a **file**, an area of the storage medium that is set aside to store a program or a collection of data. Files are of various types. They are always named, and they can be organized into "file cabinets" called directories. Just as a filing cabinet has different

drawers to organize related information, different file directories store related types of files.

Types of Files

All computers have two basic kinds of files: program files and data files. **Program files** contain programs of all kinds, ranging from system programs (such as the program used to format disks) to application programs (such as a spreadsheet or word processing program). Most programs use several support files. These files store additional programs and other information that may be needed in order for the program to run correctly. If any files are missing, the program may not work as expected.

Data files are created to store the data that programs use. Most programs store data in a **proprietary file format**, a data-storage format used only by the company that makes the program. For example, the word processing program WordPerfect creates data files in the WordPerfect format. These files can be read by other word processing programs only if they are equipped with a special translation program, called a **conversion utility**. Data files can be grouped according to the kind of data they contain. Here are some common types of data files:

- **Configuration files** contain settings or configuration choices that a program requires in order to run correctly. You should never alter or delete a configuration file, particularly one required by a computer's operating system.
- **Text files** contain nothing but standard characters (letters, punctuation marks, numbers, and special symbols), such as those of the ASCII character set. Almost any application program can read a text file.
- **Graphics files** contain pictures in a specific graphics format used for storing digitally encoded pictures. Common graphics formats include **Joint Photographic Experts Group (JPEG)** and **Graphics Interchange Format (GIF)**. To read a graphics file, you must use a program that recognizes the file's format.
- **Database files** contain data that has been stored in the proprietary file format of a database program.
- **Sound files** contain digitized sounds, which can be played back if your computer is equipped for multimedia.
- **Backup files** contain copies of essential data.

8. Read the text and list the items of a data storage hierarchy from smallest to largest.

Storage in Data Processing Applications

Most commercial computer systems have an important job to do: They keep track of transactions, such as sales, purchases, orders, and returns. In these systems, database

files must keep track of transactions without error. Lost data or errors could cost a company a great deal of money; some companies have gone bankrupt because of problems with their computer systems. For this reason, data processing professionals pay close attention to the way these files are organized and used.

In data processing, computer storage is conceptualized as a data storage hierarchy. The smallest item of data is a single binary digit (a bit), either a 0 or a 1. Bits are combined to form a character (or byte), such as the letter A or the number 7. Characters are combined to form a field, which is a single data item such as a name or Social Security number. Related fields are combined to form a record, and records are combined to form a file.

For example, all the data items that the school has about you are combined to form your student record. The records for each student that attends your school are combined to form the student file. In addition to maintaining the student file, the school maintains many other files, such as a class file containing a record for each class offered during the current term.

Consider another example. A library has a file of all the books it owns. This file is composed of records, one for each book. Each record contains the same four fields: title, author, publisher, and ISBN number. Each field contains a number of characters, and each character is composed of eight bits.

UNIT 2 Data In, Information Out

1. Read the text and identify the most common input devices.

Input Devices

You can enter data into the computer in many ways. The most commonly used input devices are keyboards; pointing devices, such as mice and trackballs; and scanners. Many other special-purpose input devices are available, and computers often have more than one input device. For example, most personal computers have both a keyboard and a mouse.

Keyed Input

You enter most input data into the computer by using a keyboard. This input method is similar to typing on a typewriter.

Most typewriter and computer keyboards are **QWERTY keyboards**. The alphabetic keys are arranged so that the upper-left row of letters begins with the six letters *Q W E R T Y*. Designers of other keyboards claim that their boards are easier to learn than the QWERTY keyboard. The Dvorak keyboard is one example. It is not widely accepted, however, because most people have already learned the QWERTY keyboard. In other parts of the world, you will find different keyboards. The coding used on the QWERTY and Dvorak keyboards works with an 8-bit code, which accommodates 256 different characters. Asian languages have many more characters. The Kanji alphabet,

for example, has 50,000 characters. Japanese keyboards have to work with a 16-bit code to accommodate all the characters.

Computer keyboards include keys that are designed to perform specific tasks. These special keys include function keys, directional keys, and special-purpose keys such as Alt, Ctrl, Del, Enter, Ins, and Esc. These keys enable the user to perform complex tasks easily when using the application. For example, many applications use a function key to access online help for the user.

Some new keyboards have 107 keys, with the three new keys designed to simplify working with Windows 95. Two of these keys, next to the Alt keys, bring up the Start menu. The third key, next to the right Ctrl key, brings up a menu of functions that are frequently accessed in whichever application is currently being used.

Prolonged keyboard use can cause wrist problems, sometimes so serious as to require surgery. To help prevent these problems, ergonomic keyboards are beginning to appear on the market.

One special type of keyboard construction is the **membrane-switch keyboard**, on which the keyboard is covered by a protective film. Membrane-switch keyboards are reliable, durable, and resistant to such hazards as liquids or grease. However, membrane keys require more pressure than keys on a standard computer keyboard. You have probably seen membrane-switch keyboards in fast-food restaurants. Membrane-switch keyboards are ideal in manufacturing situations that require little actual keying.

Many computer systems are designed for source-data automation. These systems place keyboards and display units at the most convenient spot for data entry. An example is the use of point-of-sale (POS) cash registers in retail stores. POS registers send data directly to a computer file for later processing. This technique gives an advantage because most so-called computer errors are actually keying errors. Capturing data at the source minimizes errors because the people who key the data are doing a variety of tasks and are therefore less likely to make errors due to boredom.

2. Read the text and discuss trends in pointing devices.

Pointing Devices

Many people use pointing devices instead of keyboards whenever possible. Pointing devices minimize the amount of typing (and the number of errors). The many pointing devices available include the mouse, trackball, light pen, digitizing tablet, touch screen, and pen-based system.

The Mouse and the Trackball

The mouse is a palm-size device with a ball built into the bottom. The mouse is usually connected to the computer by a cable (computer wires are frequently called cables) and may have from one to four buttons (but usually two). The mouse may be mechanical or optical. Mice come in many shapes and sizes. When you move the mouse over a smooth surface, the ball rolls, and the pointer on the display screen moves in the same direction. The Apple Macintosh, with its graphical user interface, made the mouse popular. Now

most microcomputer systems, regardless of the manufacturer, use a mouse. With the mouse, you can draw, select options from a menu, and modify or move text. You issue commands by pointing with the pointer and clicking a mouse button. In addition to minimizing typing errors, a mouse makes operating a microcomputer easier for beginning users.

A trackball is like an upside-down mouse. Used similarly to the mouse, the trackball is frequently attached to or built into the keyboard. The main advantage of a trackball is that it requires less desk space than a mouse. (Some individuals in the computer industry believe that the mouse will soon be replaced by devices that do not require as much space to use.)

The mouse is not practical for people using a laptop computer in a small space. Early alternatives, such as trackballs clipped to the side of the keyboard, have not proved satisfactory. The Apple PowerBook uses a central trackball. The IBM ThinkPad replaces the trackball with a red plastic button, called a trackpoint, located in the middle of the keyboard. You move the button with your thumbs. The newest Apple Power Books have a small square of plastic on the keyboard that moves easily to control the pointer.

A device that was released in 1995 enables the user to move the cursor using an infrared pen. The pen is cordless and works when it is as fifteen feet from the screen. Although the mouse is still the most popular pointing device, these innovations may change that.

Joysticks

A joystick is a pointing device often used for playing games. The joystick has a gearshift-like lever that is used to move the pointer on the screen. On most joysticks, button on the top is used to select options. In industry and manufacturing, joysticks are used to control robots. Flight simulators and other training simulators also use joysticks.

Touch-Sensitive Screens

Perhaps the easiest way to enter data is with the touch of a finger. Touch screens enable the user to select an option by pressing a specific part of the screen. Touch screens are commonly used in grocery stores, fast-food restaurants, and information kiosks.

Pen-Based Systems

Have you received a package from United Parcel Service recently? If so, you probably signed for it on a special pad, using an electronic pen.

Pen-based systems are especially useful for people who do not like to type or who are frequently on the move. Personal digital assistants (PDA), such as the Apple Newton, are designed for people on the go. The Newton can link entries with stored files. For example, if you write “Call Margaret and wish Happy Birthday”, the Newton adds a line to your “To do” list and links Margaret’s phone number from your telephone directory. If your friend Ken moves, you can simply change his address and phone number. The Newton serves equally well as a calendar, calculator, and notepad.

Pen-based systems are not perfect – they do not always register handwriting correctly. Pen-based computing is just beginning to gain widespread acceptance. For example,

many stores no longer have you sign a carbon form to charge a purchase; instead you sign on a tablet that automatically records your signature.

A different type of pen called a light pen is used by many engineers and architects. The light pen uses a photoelectric (light-sensitive) cell to indicate screen position to the computer. You operate the pen by touching it to the screen. Light pens are frequently used for computer-aided design (CAD) applications.

Another tool used in CAD applications and other graphics applications is a digitizing tablet. A **digitizing tablet** consists of a grid on which designs and drawings can be entered. Most tablets are pressure-sensitive, and the user draws directly on the tablet using a special pen called a **stylus**, or a puck. Digitizing tablets are used to design cars, buildings, medical devices, and robots.

3. Read the text and briefly list some types of scanning devices.

Data Scanning Devices

Optical recognition systems provide another means of minimizing keyed input by capturing data at the source. These systems enable the computer to “read” data by scanning printed text for recognizable patterns.

The banking industry developed one of the earliest scanning systems in the 1950s for processing checks. The Magnetic Ink Character Recognition (MICR) system is still used throughout the banking industry. The bank, branch, account number, and check number are encoded on the check before it is sent to the customer. After the customer has used the check and it comes back to the bank, all that needs to be entered manually is the amount. MICR has not been adopted by other industries because the character set has only fourteen symbols.

Of all the scanning devices, you are probably most familiar with **bar code readers**. Many retail and grocery stores use some form of bar code reader to determine the item being sold and to retrieve the item price from a computer system. The code reader may be a handheld unit, or it may be embedded in a countertop. The bar code reader reads the Universal Product Code (UPC), a pattern of bars printed on merchandise. The UPC has gained wide acceptance since its introduction in the 1970s. Initially, workers resisted the use of the code because the system was used to check their accuracy and speed. Today, bar codes are used to update inventory and ensure correct pricing. Federal Express uses a unique bar code to identify and track each package. Federal Express employees can usually tell a customer within a matter of minutes the location of any package.

Optical scanners can scan typed documents, pictures, graphics, or even handwriting into a computer. Photographs scanned into a microcomputer appear clearly on the screen and can be displayed whenever desired. The copy that the computer has stored will never yellow with age. Early scanners could recognize only text printed in a special **optical character recognition (OCR)** typeface. A scanner converts the image in the computer. This conversion process is known as **digitizing**.

Depending on the volume and type of material to be scanned, you can use drum

scanners, flatbed scanners, sheet-fed scanners, and even small handheld scanners. The small, handheld scanners have been used most frequently with microcomputers; however, only 5 percent of all microcomputer systems are equipped with scanners. Manufacturers responded to user reluctance to use scanners by releasing in 1995 a number of new, small, paper scanners. Most of these new devices sit between the keyboard and the monitor and can interface with a fax machine, send e-mail, and store documents on disk for archive purposes.

4. Read the text and explain why alternatives to voice recognition devices are being developed.

Voice Recognition Devices

Voice input and control systems have the potential of revolutionizing the way we communicate with computers. Steady progress has been made in this area, although there are still some problems. The day may soon come when we can talk to our computers the way the actors do on Star Trek.

Computer scientists and linguists have been working on **voice recognition systems** for two decades. The major difficulty has been that people speak with different accents and intonations. For this reason, most successful voice recognition systems require a period of “training” while the system becomes accustomed to an individual’s accent and intonation.

The first systems could recognize only a few dozen words. A system recently released by IBM, known as Voice Type, is capable of recognizing as many as 32,000 words and is speaker independent.

Voice recognition has unlimited possibilities and will make computers much easier to use. Speech recognition systems are already being used in many types of settings. In factories, workers use speech recognition systems to control robotic arms when the worker’s own hands are busy. Speech recognition systems enable physically disabled people to use computers. A microcomputer **Voice User Interface (VUI)**, capable of recognizing input from a variety of individuals, will be considered standard soon.

Video digitizers can capture input from virtually any type of video device, such as VCRs, televisions, and camcorders. Audio digitizers can digitize music or voice from a microphone. It is fairly easy to capture a portion of a television show, add some music that complements the picture, and play back the result on a microcomputer to create a multimedia presentation.

5. Read the text and distinguish between hard copy and soft copy.

Output Devices

Output Devices are as varied and as innovative as input devices. From traditional printed output to audio output and robots, there are a multitude of forms of computer output.

Most output can be divided into two categories: soft copy and hard copy. **Soft copy** is

ideal when you are writing a document, playing a game, watching a video clip, or reading the latest news. Soft copy is what you see on the monitor. Soft copy is temporary; after you have finished with it, there is nothing solid to hold. You can, however, transfer soft copy to a disk to transport it. **Hard copy** can be touched and carried. Hard copy is usually some form of paper output. It is especially helpful if you need to have a colleague look at your work or you need to give your work to a supervisor or teacher.

6. Read and speak on different kinds of monitors and differences between them.

Monitors

When you think about viewing computer output, you probably visualize a **monitor**. Monitor output is soft copy; when you have finished viewing it you cannot pick up the output and move it. Monitor displays are the most common form of soft copy.

Sometimes, when watching television, you may notice that the picture looks a little snow. This condition occurs because the images are not solid but rather created by configurations of dots. These dots, or **picture elements**, combine to form the image you see. The more picture elements, also known as **pixels**, the better the **resolution** of the image. The better the resolution, the clearer the picture. Computer monitors are similar to television screens.

The large monitors that you see connected to desktop computers are **cathode-ray tube (CRT) monitors**. The smaller monitors that are used on laptops and notebook computers are known as flat-panel displays. Flat-panel displays weigh less and consume less electricity than CRTs. Common types of flat-panel displays include **liquid crystal display (LCD)**, **electroluminescent (EL) display**, and gas plasma display. Flat-panel display monitors are still more expensive than CRTs but will eventually decrease in price. Most new monitors are **SVGA (Super Video Graphics Adapter)** with a pixel configuration of 800 by 600 at low-resolution mode and 1024 by 768 at high-resolution mode. The higher resolution with more pixels provides a clearer, more detailed image. Each pixel displays a single color at a time. To display 256 colors (each with its own code) requires eight bits.

One monitor may look “sharper” than another even though they have the same pixel configuration. This is due to the **dot pitch**, which is the distance between pixels. (A .28 dot pitch gives a crisper image than a .30 dot pitch. The .28 dot pitch is fairly standard.) The dot pitch is built in by the manufacturer and cannot be changed.

Monitors are also categorized by whether they display in black and white (**monochrome**) or color. Monochrome monitors are rapidly becoming a thing of the past, as most applications today require color. In fact, a display of 256 colors is usually necessary for working with informational CD-ROMs and clip-art collections.

In order to connect a monitor to a microcomputer, you must have a **graphics adapter board** (also known as a video card). Each type of monitor requires a different type of board. The graphics board plugs into an expansion slot inside the computer, and the monitor plugs into the board. In order to run today’s graphics-intensive programs

properly and quickly, most graphics boards come with some memory capability, known as **video memory**. It is important to realize that **video RAM (VRAM)** must meet higher performance specifications than regular RAM. It is recommended that instead of using RAM on a video card, the user should place VRAM or **dynamic RAM (DRAM)**, which is slightly slower than VRAM, on a video card.

The **refresh rate** on a monitor is also important and is affected by the video card. Even a steady image is constantly regenerated, or refreshed, from top to bottom. A slow refresh rate of 60 times per second (60 Hz), can cause headaches; 70 Hz is a reasonable minimum. Some monitors, known as **interlaced monitors**, refresh every other line; **non-interlaced monitors** are easier on the eyes. The **Motion Picture Experts Group (MPEG)**, has developed standards for video compression that improve the quality of the video on the monitor. MPEG drives are available as software or as hardware built in a video card.

Audio Output

Audio output is a second type of soft copy. New computer systems have such good audio systems that it is possible to listen to music while you work, have the computer tell you when the printer needs paper, play games that include sound, or compose music on the computer. In order to have high-quality audio output, a good quality sound card and speakers are needed.

New sound cards even include the capability to have the computer read a text file to you while you continue working on a different application. Voice input and output have proved helpful to individuals with speech and vision impairments. Someone with a speech impairment can key a message into a computer and have the computer say it. Of course, computer-generated voices are not human; they are synthesized. **Speech synthesis**, having the computer speak, is a much simpler process than speech recognition.

7. Read the text and speak on the difference between kinds of printers.

Printers

The second most common form of computer output is printed documents. Although a computer can operate perfectly without a printer, it is certainly helpful to the user to have one. Because you can hold printed output, it is considered a form of hard copy.

Printers can be categorized by whether anything mechanical actually touches the paper; whether they do or do not produce a solid character; and whether they produce a page, a line, or a character at a time.

When a part of the printer presses the paper to form the character, the printer is considered an **impact printer**. Impact printer can produce carbon copies and are fairly loud, although covers are available to muffle the noise. In contrast, **nonimpact printers** are quiet. However, because nothing presses on the page a nonimpact printer cannot produce carbon copies.

8. Read the texts and speak on the different kinds of printers.

Nonimpact Printers

Nonimpact printers are increasing in popularity largely because of improvements in print quality coupled with decreasing cost. Nonimpact printers can produce both text and graphics. Because nothing actually strikes the paper, nonimpact printers are fairly quiet. Some of the most popular nonimpact printers are laser printers and inkjet printers.

Laser printers work in the same manner as copy machines; a laser beam creates electrical charges that attract toner to form an image and transfer it to paper. Laser printers come in a variety of sizes; generally the larger and faster the printer, the more expensive it is. Large laser printers are used on mainframes and minicomputers where high-quality graphic output is required. Small, “personal” laser printers are suitable for home use.

Inkjet printers are also popular for microcomputers. Although the resolution is lower on inkjet printers than on laser printers, the resolution is higher than that of dot-matrix printers. Inkjet printers are significantly less expensive than laser printers. Electronically charged ink is sprayed through a jet nozzle and passed through an electronic field, which deflects the ink to form a dot-matrix character. Color inkjet printers, which use multiple nozzles, are available at very reasonable prices.

Plotters

A **plotter**, like a printer, produces hard-copy output. Plotters, which produce high-quality color graphics, are usually categorized by whether they use pens or electrostatic charges to create images. A continuous-curve plotter is used to draw maps from stored data. Computer-generated maps can be retrieved and plotted or used to show changes over time.

UNIT 3

1. Read the text and say what a supercomputer is and why we need it.

Supercomputers

Supercomputers are the largest, fastest, most powerful, and most expensive computers made. Like other large systems, supercomputers can be accessed by many individuals at the same time. Supercomputers are used primarily for scientific applications that are mathematically intensive. The aerospace, automotive, chemical, electronics, and petroleum industries use supercomputers extensively. Supercomputers are used in weather forecasting and seismic analysis. They are found in many public and private research centers, such as universities and government laboratories. A supercomputer was used to alert scientists to the impending collision a comet with Jupiter in 1994, giving them time to prepare to observe and record the event. The United States

Department of Energy recently contracted with IBM for an “ultrasupercomputer”, three hundred times faster than any existing machine. The ultrasupercomputer will simulate nuclear explosions (eliminating the need to detonate any bombs), model global weather trends, and design power plants.

The first supercomputer was built in the 1960s for the United States Department of Defense. This computer was designed to be the world’s fastest and most powerful computer of that time. The commitment to create the fastest, most powerful computer in the world is still the driving force behind the development of supercomputers. Manufacturers produce relatively few of any model of supercomputer, and they spend millions of dollars on research and development of new machines.

Supercomputers derive much of their speed from the use of multiple processors. **Multiprocessing** enables the computers to perform tasks simultaneously – either assigning different tasks to each processing unit or dividing a complex task among several processing units. The first supercomputer had four central processing units; the **massively parallel processors** of today contain hundreds of processors.

The speed of modern supercomputers is measured in nanoseconds and gigaflops. A **nanosecond** is one billionth of a second. A **gigaflop** is one billion floating-point arithmetic operations per second. Supercomputers can perform at up to 128 gigaflops, and use bus widths of 32 or 64 bits. This capability makes supercomputers suitable for processor-intensive applications, such as graphics. Supercomputers are rarely used for input/output-intensive processing, such as accounting or record-keeping operations.

Leaders in the development of supercomputers include Cray Research Company, Silicon Graphics, Thinking Machines Corporation, Fujitsu, IBM, and Intel. Cray Research Company, founded by Seymour Cray in 1972, has been the undisputed leader in this segment of the computer industry ever since. Silicon Graphics challenged that lead in 1995. Then, in 1996, it merged with Cray, which became a subsidiary of Silicon Graphics. Cray Research delivered a 256-processor system to the Swiss Federal Institute of Technology. And Silicon Graphics opened a technology center, directly connected to Silicon Graphics’ headquarters in California, to develop supercomputer applications in China.

Thinking Machines has produced a supercomputer called the Connection Machine, which has over 64,000 processors. The Connection Machine is reasonably priced at \$5 million. Silicon Graphics is mass-marketing the Cray T90 and Cray J90 with price tags of \$500,000 to \$2,500,000. Supercomputers have traditionally ranged in price from \$2 million to \$20 million.

2. Read and say what mainframe is composed of and speak on its capabilities.

Mainframes

Since the first UNIVAC I was sold in 1951, the **mainframe computer** has been the cornerstone of the computer industry. IBM, the giant of the computer industry, captured the mainframe market in the late 1950s and made its name and fortune manufacturing

mainframe computer systems. Mainframes are the most widely used type of computer in large businesses. IBM still holds an estimated two-thirds of the mainframe market.

The typical mainframe computer occupies much of a large room. Like supercomputers, mainframes require an environment with closely monitored humidity and temperature. Mainframe computers are priced between \$100,000 and \$200,000.

For input/output-intensive operations, mainframe computers are much more suitable than supercomputers. Many modern mainframes have multiprocessing capabilities; however, they are generally limited to eight or fewer processors. The processors in mainframes are slower than those in supercomputers, with speed measured in **megaflops** (millions of floating-point arithmetic operations per second) rather than gigaflops.

A mainframe computer system is usually composed of several computers in addition to the mainframe, or host processor. The **host processor** is responsible for controlling the other processors, all the peripheral devices, and the mathematics operations. A **front-end processor** is responsible for handing communications to and from all the remote **terminals** connected to the computer system. Sometimes a **back-end processor** is used to handle data retrieval operations. Although the host computer could perform all these operations, it can be used more efficiently if relieved of time-consuming chores that do not require processing speed.

Mainframe computer systems are powerful enough to support several hundred users simultaneously at remote terminals. Terminals can be located near the computer or miles away. Computers can support hundreds of users by keeping numerous programs. Because computers are so much faster than people, the users never notice that the computer is handling other tasks. This capability to process many programs concurrently for multiple users is known as **multiprogramming**.

The introduction of the microcomputer and the increased capabilities of minicomputers have resulted in a decline of sales of mainframe computers. Recently, to bolster sales of mainframes, IBM started producing mainframes based on arrays of microprocessor chips and designed to be servers for giant databases used on networks of microcomputers.

3. Read the text and speak on the differences and similarities between minicomputers and mainframes.

Minicomputers

The "age of the mini" started in the late 1960s. The creation of integrated circuits suitable for computers enabled designers to shrink the size of the computer. Before Digital Equipment Corporation (DEC) released the first DEC PDP-8 **minicomputer** in 1968, most medium-sized organizations were priced out of the computer market because they couldn't afford mainframe computers. The DEC minicomputer cost around \$50,000 — a considerable savings compared with the \$200,000 mainframe of that time. Like mainframes, most minicomputers are multiuser systems. Many of today's minicomputers can accommodate as many as 200 users working from individual

terminals. Petrochemia Plock installed a Microvax 3100 minicomputer system by DEC at its fuel terminal on the northern coast of Poland. The minicomputer system will oversee the flow of fuel to distributors and dealers across the country, ensuring that deliveries of fuel are dispensed to the correct drivers. The system is similar to systems used by Esso and Shell in refinery and delivery plants throughout Europe. The major difference between mainframes and minicomputers is in scale. Minicomputers can perform the same types of tasks as mainframes, but minicomputers are a little slower. Like mainframes, minicomputers can accommodate remote users, but not as many. Minicomputers' input, output, and storage devices look like those on mainframes; but minicomputers have slightly less storage, and the printers are slightly slower. The distinctions between these categories of computers are blurring as time passes. Minicomputers are frequently referred to as mid-range computers.

4. Read and speak about the categories of single-user computers.

Workstations and Microcomputers

When you are working on a multiuser computer, such as a mainframe or minicomputer, you can control the input and see the output on the display, but you control nothing else. A single-user computer gives you control over all the phases of computer processing: input, processing, output, and storage. You can select the programs you want to use, and you don't have to compete with other users to gain access to the system. A single-user system is designed to meet the computing needs of an individual. Single-user computers fall into two categories: workstations and microcomputers.

5. Read and say why a workstation was developed and speak on its peculiarities.

Workstations

A workstation is a powerful desktop computer designed to meet the computing needs of engineers, architects, and other professionals who need detailed graphics displays. For example, workstations are commonly used for computer-aided design (CAD), in which industrial designers create pictures of technical parts or assemblies. To process these complex and detailed diagrams, the computer needs great processing power and much storage. Workstations are also frequently used as servers for local area networks.

Workstations are small, powerful systems designed to drive networks of less powerful microcomputers and to create high-quality graphics. Workstations typically cost \$5,000 to \$20,000. Major competitors in this market include DEC, Hewlett-Packard, Sun, and Silicon Graphics, Inc.

The workstation has sometimes been called a "supermicro." The workstation looks very much like a desktop microcomputer, but the chips inside make the difference. Most workstations use reduced instruction set computer (RISC) microprocessors. Computer designers have discovered that by eliminating infrequently used preprogrammed instructions, they can increase the speed of the processor. Many new processor chips,

including the DEC Alpha and the PowerPC, are RISC chips. RISC processors are particularly useful in special-purpose applications, such as graphics, in which speed is critical. The DEC Alpha chip was the first microprocessor designed to work with a 64-bit bus.

6. Read and say what the difference is between multiprogramming and multitasking, and also determine the difference between workstations and microcomputers.

Microcomputers

It is difficult to overstate the impact of the microcomputer on the computer industry. In 1975, the microcomputer did not exist. In 1995, sales exceeded \$116 billion. Microcomputers are the fastest growing segment of the computer industry.

The microcomputer segment of the industry is complex; there are different types of microcomputer platforms with varying capabilities. The most common type of microcomputer is a desktop computer, which is a nonportable personal computer that fits on top of a desk. The desktop microcomputer market has been divided into two types of computers: Apple and IBM/IBM compatible. In 1994, Power Computing Corporation began marketing Macintosh-compatible computers, raising the possibility of a new microcomputer market segment. Presently, Apple has about 8 percent of the market, IBM has about 28 percent, and IBM compatibles have most of the rest.

A few years ago, Apple Computer, IBM, and Motorola joined to develop the PowerPC chip, which enables Apple computers to run IBM applications and vice versa. Most Apple Macintosh computers and compatibles are based on this chip. IBM released its PowerPC chip machines.

Recently, Intel countered with the Pentium Pro chip. (Intel's 586 chip is known as Pentium, which is Greek for 5; Intel's 686 chip is the Pentium Pro.) All the new microprocessors — Pentium Pro, PowerPC, and Alpha — are designed for 64-bit systems. The boundary between workstations and personal computers is becoming less distinct. Today's best personal computers are more powerful and offer more precise displays than the workstations of the recent past. The new Pentium Pro microcomputers have multiprocessing capabilities. In addition, the distinction between workstations and minicomputers is becoming blurred because of the most powerful workstations. These workstations can be equipped so that more than one person can use the workstation at once, in effect making the workstation a minicomputer.

Most microcomputers enable the user to switch between tasks. This capability is known as **multitasking** — a single-user variation on multiprogramming. Multitasking can be a great timesaver. This capability to task-swap saves time.

People frequently refer to a personal computer as a **microcomputer**, a computer that uses a microprocessor for its processing circuitry. The term *microcomputer* originated in the late 1970s, when the only computers that used microprocessors were PCs. But today all kinds of computers use microprocessors. By this definition, most of today's computers, including some supercomputers, are microcomputers. But people usually mean PC when they use the term microcomputer.

For many people, the abbreviation PC refers only to an IBM or IBM-compatible personal computer. When IBM introduced its first personal computer in 1981, the firm chose the name IBM Personal Computer — IBM PC, for short — for the product. You may still hear people say something like "Oh, she's not using a PC, she's using a Macintosh." As the people at Apple Computer are fond of pointing out, though, both the IBM PC and the Macintosh are personal computers.

Review

On a separate sheet of paper, answer the following questions.

1. Compare supercomputers and mainframes with respect to their suitability for different purposes.
2. A mainframe computer system is usually composed of several computers in addition to the mainframe, or host processor, itself. Describe the peripheral processors and their functions.
3. What are several of the operational differences between mainframes and minicomputers?
4. Describe a computer workstation.
5. Give some examples of items that contain embedded computers.
6. Can you think of some uses for smart cards that were not discussed in this lesson?
7. What is the difference between multiprogramming and multitasking?
8. How is a smart card different from a credit card?
9. Sizes of computers are sometimes known as platforms. List the platforms, from largest to smallest, that were discussed in this lesson.
10. Describe how a workstation would differ from a microcomputer found in the home.

UNIT 4

1. Read and speak on the difference between system software and application software.

The Role of Software

Hardware needs software, or programs, to work. The type of software you use depends on the job. Software is generally one of two types: system software or application software. **System software** controls and coordinates the computer hardware. **Application software** is designed to solve a specific problem or do a specific task.

Application software includes **special-purpose programs and general-purpose programs**. A special-purpose program solves a specific problem usually for a specific profession or industry. A registration program to sign up for a class is an example of a special-purpose program. General-purpose software is the backbone of the microcomputer industry. These software programs can do a variety of related

tasks.

2. Read and identify the functions of an operating system.

System Software

Programs designed to act as intermediaries between the hardware and application programs are called system software. These programs help the hardware components work together and provide support for application programs. System software includes operating systems, operating environments, language translators, utility programs, and performance monitors. The computer's operating system and the operating environment are the most important kinds of system software.

Operating Systems

An **operating system** is a group of programs that help the computer's components function together smoothly. Some parts of an operating system operate automatically, without requiring human intervention. Other parts provide utilities to the user for carrying out system maintenance tasks.

How does an operating system do its job? The operating system must first be loaded into primary storage. This process of loading is called **booting** the system. After the operating system is loaded, one part of it, called the **supervisor program**, remains in primary storage all the time. Such a program is called a **resident program**. Other parts of the operating system are kept on disk and loaded into primary storage only when needed. These programs are called **transient programs**.

Although operating systems are different, they have three common features. All operating systems do the following:

- Manage resources
- Control input and output processes
- Enable the user to communicate with the operating system

3. Read the text and say what the difference between multitasking and multithreading is.

Managing Resources

The resources managed by the operating system are the various hardware components, including the CPU. One important task performed by the operating system is to control the execution (running) of programs. **Multitasking** is the capability of an operating system to work on more than one task (program execution) at the same time. Whenever a task is waiting for input or output (I/O) operations to be completed, the CPU can be executing another task. Multitasking capabilities were once found only on minicomputers and mainframes. Now some personal computer operating systems, such as Microsoft Windows and Macintosh System 7.5, offer multitasking. **Multitasking** is the capability to run multiple executions of one program. Microsoft's Windows 95 has that capability. You could have the

program spell-checking a large document while you continue to write in the same document.

4. Read and say what the importance of the BIOS is.

Controlling Input and Output Processes

Input and output devices and storage devices require much attention. The operating system knows what a device needs and responds when the device needs it. Because input and output devices are much slower than the CPU, this immediate attention keeps the I/O devices from delaying the processing any longer than necessary.

Part of the control of the input and output devices comes from the BIOS or ROM-BIOS. The **BIOS**, or **Basic Input/Output System**, is a ROM chip that is built into the computer's memory and that checks the input and output devices when the system is started.

5. Read and distinguish between operating systems and operating environment.

Operating Environments

A large part of the user interface is the operating environment. When Apple Computer introduced the Macintosh computer, it provided a different operating environment. The operating environment is the “look and feel” of using the computer and its operating system. The Macintosh offered the first popular use of a **graphical user interface** or **GUI** (pronounced gooey). Before GUIs, operating systems required the user to know many commands and what their options were. With this more user-friendly operating environment, the user was shown menus with options listed. Many times, the options were shown as icons, or pictures; the user could just point to an icon with the mouse and then click to indicate the choice. This process is called “point and click”.

Microsoft recognized that GUIs were easier to use and that people learned to use them more quickly than nongraphical interfaces. The company developed Windows – and most recently Windows NT – to use this friendlier environment on IBM and IBM-compatible computers. Today's operating systems may use a command-line environment, like MS-DOS; a menu-driven environment, like a shell; or a graphical user interface environment, like Macintosh or Windows.

6. Read the text and speak about the most common user operating systems.

Commonly Used Operating Systems

Different computers use different operating systems. Many IBM and IBM-compatible microcomputers use MS-DOS alone, a combination of MS-DOS and a version of Microsoft Windows, or a version of Windows alone. Macintosh computers currently use

the Macintosh System 7.5. Most computer system – from PCs to supercomputers – can use the UNIX operating system. Table lists some common operating systems for microcomputers.

Table Common Microcomputer Operating Systems

<i>Operating System</i>	<i>Used Primarily on these Computers</i>
DOS (Disk Operating System)	IBM and IBM-compatible, single-user computers
Microsoft Windows 3.1	IBM and IBM-compatible computers that are also running DOS and using an 80286 microprocessor or later (preferably a later version for better performance)
Microsoft Windows 95	IBM and IBM-compatible 486DX 33MHz or faster (preferably) with 100M of hard disk space and 16M of RAM preferred
Microsoft Windows NT (a network/multiuser operating system)	IBM and IBM-compatible, multiuser computers with 75M of hard disk space and 12M of free RAM; also works on computers with RISC chips, 90M of hard disk space, and 16M of RAM
Macintosh System 7.7	Macintosh computers
UNIX	Multiuser minicomputers and mainframes in corporate and university environments; also some personal computers

How the BIOS Works with Software

1. When you choose the commands for saving a file in your word processor, the word processor sends the command and the data to be saved to the operating system. (In a Windows environment, Windows acts as an extension of the operating system to help handle command operations.)
2. The operating environment checks to make sure that the command to save data has no problems. For example, the operating environment makes sure that the file name is a legal one and that you're not trying to save over a file that's marked read-only. If everything is OK, the operating environment turns the job of writing the data to disk over to the BIOS.
3. The BIOS sends the data to the disk drive controller along with a prepackaged routine of commands tailored specifically to the controller or drive. (The commands may exist as part of the code in a BIOS chip on the controller or on the disk drive's circuitry.)
4. The BIOS instructions are translated into the electrical signals needed to move the drive's read/write heads to the proper locations on the disk and to create the magnetic signals that record the data on the disk's surface.

7. Read and identify major characteristics of Windows 98 and UNIX.

Windows 98 and Internet Explorer 4.0

Most reviews of Windows 98 rate it as little more than a small refinement of Windows 95. A collection of patches, a series of add-ons, and relatively minor improvements to hardware support are all part of the Windows 98 fine-tuning. The operating system, software compatibility, and system requirements do not reflect any major changes.

Windows 98 does promise to take full advantage of the latest advances in hardware, especially MMX technology. The implications are that audio files will be viewed much faster. Games requiring audio and video and video capabilities are to run better under the new system. Also, multiple video displays are available on a single PC.

Microsoft is promising that Windows 98 will be a more reliable system. New and updated utilities will keep hardware and software in optimal performance. Windows 3.1 used a utility known as Dr. Watson, which is reintroduced in Windows 98. It will help the user troubleshoot software problems that can freeze a machine.

The biggest addition to Windows 98 is the Web integration, which is complete and is connected directly to the operating system. Internet Explorer 4.0 is used not only to browse the Internet but to access data and run programs. The files on your hard disk can be viewed as if you are looking at a Web page.

Internet Explorer 4.0 (IE 4.0) operates exactly the same in Windows 95 and Windows 98. It is not necessary to purchase Windows 98 to get IE 4.0. It can be downloaded free from the Internet. Of course, free is a relative term, because this 22M file takes hours to download (nearly 10 hours using a 56Kbps modem).

UNIX

UNIX is a multitasking operating system used on a wide variety of computers, from mainframes to personal computers. UNIX was designed at AT&T's Bell Laboratories as a multiuser system. Its interface is somewhat unfriendly to occasional users, but shell programs are available to help these users. Because UNIX is ideally suited to multiuser applications, it is popular in systems that have linked workstations to minicomputers and mainframes. UNIX has established a successful foothold in the university and business communities.

8. Read and say what system software consists of.

Other System Software

The operating system is a very important kind of system software. System software also includes language translators, utility programs, and performance monitors.

Utility programs assist the user with system maintenance tasks. These tasks include checking the amount of available memory, formatting disks, and scanning the system for computer viruses.

When multiple users share a computer system, they depend on the quality of the system's performance — both its speed and its availability. **Performance monitors** help maximize the system's performance by keeping track of what is happening with the various hardware devices. These programs monitor how often and how quickly an application program is being executed compared to all the other programs in the system at the same time.

9. Read the text and speak on the significance of application software and packages.

Application Software and Packages

Although system software is essential to running your computer, you need application software in order to do word processing, create a paycheck, or run an ATM. System software runs the hardware; application software makes the computer useful. Most of the time you spend in using the computer involves the use of application software. A **software package** is a group of programs that solve specific problem.

Many popular generic application software packages, such as word processing spreadsheet, and database packages account for most of the application uses on microcomputers. Application packages are designed for ease of use, often use the same interface as the operating environment, and address most of the uses people have for microcomputers.

For minicomputers, mainframes, and supercomputers, the wide variety of inexpensive, easy-to-use-application software is not available. Companies that use these larger computers have a staff of programmers to create and maintain the application software they use.

10. Read the text and speak on the trends of future developing of software.

The Future of Software

Over the years, software has become more useful as well as easier to use. It is also more customizable to meet an individual's needs. What will software be like in the future? The two biggest trends are to create software that supports the new work environment of workgroups and to create software that makes communications and networking easier and more natural.

The biggest challenge in making a workgroup effective is to ensure that its members can communicate more easily among themselves. Software being developed to support this need is called **groupware**. An example of groupware is Lotus Notes, which helps people present ideas, organize information, create brainstorming sessions, obtain feedback, and solve problems within workgroups. The newest way to coordinate

workgroups inside a company is through intranets — networks that have the structure or look of the Internet .

The Internet has created a category of software — Web browsers — that is changing how software is created and used. The use of World Wide Web software techniques like hyperlinks has made sharing data simpler than ever before. These tools are being used to create new applications faster than traditional tools can.

Software is making the use of a computer increasingly faster, easier, and more powerful. As more people are using the computer, it is becoming a friendlier tool, and *that* is encouraging even more people to start using the computer.

UNIT 5 Programming

1. Read the text and explain the purpose of programming.

What Is Programming?

Programming is the process of creating a list of stored instructions that tell the computer what to do. These instructions are written in a **programming language**, which is a formally designed set of symbols (often: referred to as *notation*) used to create sequential instructions that can be processed and executed by the computer. The instructions programmer create with a programming language are often referred to as **code**.

Programming has been called both an art and a science. Interestingly, programming attracts people from almost every kind of educational back ground, from anthropology to music to physics and everything in between Computer programming has been with us since the early 1940s, but computers were not the first machines to be programmed.

2. Read the text and list the steps how to begin a project.

Beginning the Project

The first step is to define the problem. Programming specifications are usually sent to a programming team. The specifications have been written by a systems analyst, who has worked closely with the person or group of people for whom the program is being written.

The specifications should include a description of the input available and the final output that the program should produce. The programming team will need to construct any intermediate screen displays and check with the analyst or the user to be certain that the displays are correct and easy to understand.

After the output has been designed and it has been determined that the required input data is available, the programming team can begin to design the program solution. The design phase of the project, if performed properly requires 25 to 50 percent of the total

time spent on the project.

1. The first in developing a program is to define the problem. This definition must include the needed output, the available input, and a brief definition of how you can transform the available input into the needed output.
2. The second step is to design the problem solution. This detailed definition is an algorithm, a step-by-step procedure for solving a program, the difficulty usually lies in developing a good algorithm.
3. The third step in developing a program is to code the program; that is, you state the program's steps in the language you are using. The instructions must follow the language's syntax, or rules, just as good English must follow the rules of grammar.
4. The fourth step is to test the program to be sure that it will run correctly no matter what happens. If the algorithm is wrong or the program doesn't match the algorithm, the errors are considered logic errors. Any errors in a program are called bugs; the process of finding the bugs and correcting them is called debugging the program. To test or debug a program, you must create sample input data that represents every possible way to enter input.
5. The fifth step in developing a program is to complete the documentation of the program. Documentation includes user instructions, an explanation of the logic of the program, and information about the input and output. Documentation is developed throughout the program development process. Documentation is extremely important, yet it is the area in program development that is most often overlooked.
6. The last step in developing a program is implementation. Once the program is complete, it needs to be implemented — installed on a computer and made to work properly. If the program is developed for a specific company, the programming team may be involved in implementation. If the program is designed to be sold commercially, the documentation will have to include directions for the user to install the program and begin working with it.

3. Read the text and explain how programming languages have been changed over the generations.

Types of Programming Languages

Programming languages have evolved greatly over the years. Each evolutionary stage is commonly referred to as a generation. To date, there are six generations of programming languages. With each passing generation, programming languages become easier to use; thus more and more knowledge workers are able to use programming languages. Different languages exist because each was designed for specific purposes. For example, some languages solve typical business problems; other perform large, complex calculations; and still others create graphics. The following section discuss the various types of programming languages with which you should be familiar.

4. Read the text and explain the main difference between a high-level language and low-level language.

High-Level Languages

A **high-level programming language** is a way of writing programs using English-like words as instructions. High-level programming languages combine several machine language instructions into one high-level instruction. When a programmer had to correctly write a string of 0s and 1s in machine language, assembly language required only a single letter or a short mnemonic, a term or word that is easy to identify, such as ADD for addition. And where several instructions are required to program an operation in assembly code, a high-level language requires just a single statement. Thus, as programming languages evolved, fewer written instructions and less work for the programmer accomplished more work. In other words, high-level languages are more efficient and make programmers more productive. High-level languages accomplish this through statements and syntax..

5. Read about different high-level languages and be ready to present the main features of each of them.

BASIC

BASIC is an easy-to-use, high-level programming language available on many personal computers. Written to teach programming basics to beginners, BASIC has become a language that many hobbyists use to create simple programs.

BASIC began as an interpreted language so that beginners could create a program in an interactive mode, run the program, test it, and debug it. Interpreted languages are conducive to learning programming, but they run much more slowly than compiled programs. As a result, professional programmers avoided using BASIC. Newer versions of BASIC have added compilers. Microsoft's QuickBASIC and Visual Basic produce compiled programs.

COBOL

COBOL is a high-level programming language specially designed for business applications. Released in 1960, COBOL is designed to store, retrieve, and process corporate accounting information and to automate such functions as inventory control, billing, and payroll. This language is the most widely used programming language in corporate mainframe environments. COBOL programs are verbose but easy to read because most commands resemble English. Version of COBOL are available for personal computers; the newest, Visual COBOL, is an object-oriented version of the language.

FORTRAN

As a high-level programming language FORTRAN is well suited to scientific, mathematical, and engineering applications. IBM developed FORTRAN and released it in 1957 as the first compiled high-level language. Fortran enables programmers to describe and solve mathematical calculations readily.

Pascal

Pascal is a high-level programming language that encourages programmers to write well-structured, modular programs. Pascal has gained wide acceptance as a teaching and application-development language. It is available in interpreted and compiled versions.

C and C++

As high-level programming language, C is widely used for professional programming. C combines the virtues of high-level programming languages with the efficiency of an assembly language. Using C, programmers can directly manipulate bits of data inside the processing unit. As a result, C programs run significantly faster than programs written in other high-level programming languages.

C was developed by Dennis Ritchie in 1972 at ATandT's Bell Laboratories and was used to write the UNIX operating system. Because of antitrust regulations in effect before the breakup of the Bell system, Bell Laboratories was prohibited from copyrighting C or UNIX. C compilers and UNIX are therefore in the public domain and have been adopted by virtually all colleges and universities.

The original C is used so infrequently that most programmers simply refer to C++ as C. C++ contains all the elements of the basic C language but was expanded to include numerous object-oriented programming features.

6. Read the text and distinguish the source and object codes.

Language Translators

A language translator is a type of system software. Language translator include assemblers, interpreters, and compilers. The difference in these types of translators is found in the process the translator uses to produce computer-readable machine language.

In both high- and low-level programming languages, programmers write line of programming language statements that tell the computer what to do. In high-level languages, the result is called **source code**, which can be read by people. However, the computer cannot read these instructions yet. To be readable for the computer, these instructions must be translated into **object code**, a version of the program that can be understood by the computer.

7. Read the text and speak about wide range of applications for very high-level languages.

Very High-level Languages

Some very high-level languages were designed for specific purposes, whereas others were intended to set broad standards or encompass a number of computer platforms. For example, the first high-level language was FORTRAN, a science and engineering language. FORTRAN led to the development of such very high-level languages as Pascal, C and C++, each of which is a general-purpose language. Pascal led to the development of several other very high-level languages, including ADA, a special-purpose language used exclusively for U.S. Department of Defense projects.

COBOL, a business language still widely used today, led to the development of APL (A Programming Language), a very high-level language suitable for writing mathematical programs, and LOGO, used widely in education. BASIC, first developed for students at Dartmouth College, and then improved upon by Microsoft, led to several very high-level versions known variously as QuickBASIC and TrueBASIC.

8. Read the text and explain the peculiarities of Java language.

Java

Java is also a very high-level language. It was initially designed to allow programmers to create *applets*, or small applications, for Web pages. Applets can be written to do just about anything, but commonly they are animated or contain sound. Some examples of applets include:

- Ad banners, often seen running across a Web page.
- Visitor counter that keeps track of Web site "hits."
- Image rotator or spinner, which makes a graphic or logo revolve or turn.
- Moving characters or animations.
- Text, scenes, images, or portions of screen that converge, dissolve, smear, sparkle, zoom in or out, or change colors and shapes.

Because Java is derived from C++, the code has similarities to C++. Although Java incorporates object-oriented principles, the procedural roots of Java are easily visible. Java programming is a much more traditional, procedural endeavor than programming in Visual Basic.

As Java has matured, it has become more of an object-oriented programming language and its use has broadened. Although mostly used in Web-based application

development, today programmers are using it to create a wide variety of applications, mostly on the Web, that are capable of running on many different types of computers or platforms.

9. Read the text and explain the advantages of object-oriented programming.

Object-Oriented Languages

Programming is hard work and takes time — too much time, some computer experts think. They have been working on ways to make programming simpler, easier, and faster. Object-oriented programming (OOP) languages are a recent development to improve the programming process.

What is OOP?

Object-oriented programming differs from ordinary programming. In ordinary programming, programmers focus on the procedure the computer follows to perform an action. In OOP, programmers focus on an object, such as a dialog box on-screen. This object can be programmed to perform certain actions, such as to begin printing. The object can then be copied and used in other programs whenever needed.

OOP has actually been around for a long time, since Simula-67 was developed in 1967. The programming professional didn't pay too much attention OOP, though, until PARC (Palo Alto Research Center, owned by Xerox Corporation) released a language known as Smalltalk in the 1970s.

Smalltalk was actually the basis for both the Apple Macintosh graphical user interface and Windows. The OOP philosophy was extended to C++ and Turbo Pascal in the 1980s, and recently to both Visual Basic and Java.

Traditionally, programming languages have been procedural in nature. If you wanted a computer to accomplish a task, you figured out the logical sequence of the steps required to accomplish that task, and then programmed them into the computer. Major tasks are subdivided into smaller tasks and defined in modules. This approach is commonly referred to as **top-down design**.

OOP is entirely different because it combines top-down design with bottom-up design. OOP gained popularity and importance with the use of graphical interfaces. When you look at a Windows application, what you see is a screen with a number of objects inside a window. These objects take the form of command buttons, scroll bars, text boxes, option boxes (menus) and so on. The program awaits an event in order to take some action. The event may be a keystroke or the click of a mouse button. OOP programming is frequently referred to as **event-driven programming**. The **event** is a message that causes a **procedure** (subprogram) attached to the object

to respond. These procedures are developed using traditional, top-down, procedural programming.

Programming that uses an OOP language requires adding objects to a blank form and then defining the procedures needed so that the computer will respond when an object is selected. This approach is much easier than using a procedural language that requires the programmer to develop the images on the screen, the links between them, and the procedures.

10. Read the text and list three basic principles of object-oriented programming with their characteristics.

Basic Principles of Object-Oriented Programming

OOP avoids this kind of problem by using very practical engineering techniques, much the same way an architect or engineer designs a building or an aircraft. OOP utilizes three basic principles in doing so: encapsulation inheritance, and polymorphism.

Encapsulation means that a high degree of functionality is integrated, or bundled, into each object. Encapsulation makes an object reusable because it is totally self-sufficient. Thus, when creating new programs or modifying old ones, it is much easier to link different object together.

Inheritance means that object within a specific class have the capability to share attributes with each other. Because the important traits have already been built in using encapsulation, it is much easier for the programmer to create a new program that is similar to an existing one. For example, if two programmers had a highly sophisticated word processing program, they could view objects, examine their encapsulation and inheritance characteristics, select specific objects, and build a desktop publishing program with them. Encapsulation assures the functionality; inheritance permits defining, or redefining, objects to suit them to the new application. A retrofit task such as this would be nearly unimaginable using a high-level language.

Polymorphism lets the programmer describe a set of actions, or routines, that will perform exactly as they are described *regardless of the class of objects they are applied to*. For example, in a conventionally written application program, the exact type of printer must be defined in order to print a file – even though a dozen or more printer driver files exist. If you connect another printer and do not tell the program to change printer drivers, when you issue the “print file” command, it will not execute.

Polymorphism correct this problem by directing the print command to address any object in the class – in other words, any printer driver – and to always print the file.

11. Read the text and describe visual Basic and small talk as the examples of object-oriented languages.

OOP Languages

Some very high-level languages have metamorphosed into object-oriented languages, such as QuickBasic into Visual Basic. Others, such as previously mentioned Smalltalk, were conceived and implemented exclusively for OOP. Newer OOP languages, such as Borland's Delphi, have been designed as a complete, multi-purpose development environment.

Visual Basic

The BASIC programming language was developed by Professors Kemeny and Kurtz at Dartmouth in the 1960s for use in an introductory computer class. When the first microcomputers were released, they did not have enough memory to run any of the accepted languages such as FORTRAN and COBOL because of the size of their compilers. BASIC, with its small compiler that did not have to reside entirely in memory, would run on the new, small computers. BASIC quickly became the language of the microcomputer. As microcomputers grew in power, so has the BASIC language.

Visual Basic looks very different from the original BASIC from which it was derived. Visual Basic was designed by Microsoft specifically to be used in the development of applications for graphical interfaces. There are currently an estimated 30 million Visual Basic users. The current goal of Microsoft is to use Visual Basic to make inroads on the Internet and to gain the support of the vast number of Internet users.

Like earlier versions of the BASIC language, Visual Basic is interpreted. The method used by the interpreter is not, however, the same as for previous interpreters. Interpreters for GW-BASIC, Turbo Basic, QBASIC, and QuickBasic all translated each instruction individually while the computer executed the program. The new Visual Basic interpreter translates each line individually, but does so as the program is being entered into the editor. An intermediate code, known as **p-code**, is produced that stays in memory until a command to execute the program is given. At that time, the object code is translated the rest of the way into that the CPU can execute. This process speeds up execution of Visual Basic programs because half of the interpretation is already completed before the program begins execute.

Visual Basic was designed to run in a Windows environment. Visual Basic 3 runs under Windows 3.11, and Visual Basic 4 (VB4) runs under Windows 95. VB5 is designed to create OLE custom controls (OCXs) that run in browsers on operating appeal of systems other than Windows, which expands the language.

For VB5, Microsoft has designed a smaller, faster subset of Visual Basic for Applications (VBA) that is a scripting language known as VBScript. The VBScript engine is less than 100K in size, and its source code is available free. VBScript is embedded in Hypertext Markup Language (HTML) pages as a tag. A browser downloads the script into a World Wide Web page; then the engine compiles the script and runs it.

Some concern has been expressed about the security of Visual Basic and VBScript applications. To ensure security, Microsoft is spearheading a movement among developers to develop a digital signature to verify that a component or application has not been tampered with.

One leader in the area of security is Geoffrey Rhoads, who has developed what he calls a "digital watermark" to embed a unique identifier within an image or document.

Rhoads recently formed Digimarc Corporation to commercialize his new technology, which may be the key to securing portions of the World Wide Web and the Internet.

Smalltalk

Smalltalk, as previously mentioned, is probably the best-known example of an object-oriented programming language. It was developed by Alan Kay at the Xerox Palo Alto Research Center in 1972, and it has undergone many changes and improvements on its long path to acceptance. Smalltalk pioneered the concept of programming with icons, rather than statements and syntax. Instead of the programmer typing character strings, programs are constructed by linking icons that take over the task of creating character strings — in other words, writing the code.

Most programmers feel they can develop programs using Smalltalk much faster than they can using C++. The development process permits using "what if" scenarios so that definitions may be easily refined. But because it is purely object-oriented, Smalltalk generally takes longer for programmers to master than C++. This is not due to learning the language so much as it is learning object-oriented methodology and techniques.

UNIT 6 Systems Analysis and MIS

1. Read the text and note down the main steps of the system development life cycle.

The System Development Life Cycle

The **system development life cycle** (SDLC) is the basis for creating computer systems. Once you understand the steps involved, you can see that it's a human process that involves both computer professionals and the users who run the systems. What usually occurs is that a department or user organization makes a formal request for an application or a system. A feasibility and cost study is performed. Once approved, the project proceeds according to the SDLC. To expand on what you've already studied, the SDLC is comprised of these steps:

- *Analysis.* Identifying and defining the problem.
- *Design.* Planning the solution to the problem.
- *Coding.* Writing the program.
- *Debugging.* Correcting program errors.
- *Testing and Acceptance.* Making sure the system works properly and turning it over to the users with accompanying training, as necessary.
- *Maintenance.* Keeping systems working properly and improving them when necessary.
- *Documentation.* Writing software, user, and reference documentation.

2. Read the text and explain the meaning of the terms system analysis and system design and describe the system analyst's field of activity.

Analysis and Design

System analysis is the study of an activity, a procedure, even an entire business, to determine what kind of computer system would make it more efficient. **Systems design** is the activity of planning the technical aspects for the new system. This activity is usually triggered when there is a request for a new system; for example, your company's telemarketing department might ask for an application that keeps track of customer ordering information. Large companies have found that effective early planning can cut the overall program development time and costs by as much as 60 percent.

The **system analyst** gathers and analyzes the data necessary to develop the new application. Depending on the organization and its size, he or she might also be called a systems consultant, a systems engineer, an information analyst, or a business analyst. Whatever the title, the systems analyst's tasks are to

- Analyze the problem to be solved, the data to be input, the expected output, and other system considerations.
- Interview the people who will be using the system to determine their needs, problems, and expectations.
- Determine which people and what kind of software, hardware, and monetary resources are necessary or available to solve the problem.
- Write the specifications and design the computer system and the methods for the information system to solve the problem.
- Guide or manage the project to a successful conclusion.

3. Read the text and be ready to explain the main principles of coding.

Coding

Analyzing and defining programs first involves manual tasks – easily performed without computers. Coding and debugging, which follow, are the opposite – now the pencil is put away and replaced by the keyboard.

Coding means programming in a specific programming language, or languages – writing the source code for the program. The code is compiled into the language that the CPU understands.

Source code is the program, written in a specific programming language, that is sent to the computer for processing. Coding is the same as programming, but specifically refers to writing source code. By the time coding begins, the program planning stage should be finished. If the problem has been well-defined and a good design has been created, coding can often take less time than the other steps in the system development process.

Text editors. A **text editor** is an essential tool for the coding step in the system development process. It is a program used to write, erase, and manipulate words on the

monitor screen. A text editor is very much like a word processor, but without many of the formatting features; in fact, word processing is the progeny of text editors.

Programming languages require certain formalities, and advanced text editors help programmers stick to the proper forms. For example, if a programming language asks that each line of source code be indented a certain number of spaces and end with a period, the text editor is set to automatically begin each line with a tab and end each with a period. Other functions, such as search, cut and paste, automatic word wrap, and automatic line spacing, also make coding a little easier.

Structured coding. **Structured coding** was the first structured writing technique, born of the need for a more organized way to write programs. Structured coding assumes that all programs can be written using three basic constructs: sequence, selection, and looping, as shown in the following figure. Programs written using structured coding techniques are easier to read, understand, and maintain. Structured coding is distinct from other structured techniques. You can use structured coding whether or not you use structured design techniques.

4. Read the text and explain how the debugging functions.

Debugging

In the early 1940s, a programming team found a moth in a computer tube. The moth had caused a program to fail. Ever since that incident, the term bug has been used to describe a program or hardware problem.

Detail and precision is required, almost to the point of perfection, to make a program run successfully; therefore, bugs must be eliminated. A debugger is a system software that helps programmers identify errors. For example, the debugger may be used when a program runs but fails to produce the correct output. A debugger reports problems as error messages. The compiler also identifies program errors so that the programmer can debug, or correct, the program.

Programmers use error message listings to track down bugs. Debugging can be a costly process, consuming as much as 50 percent of program development time. Modern debugging tools, such as those found in the information engineering development environments discussed later in this chapter, help programmers spot troubles more quickly.

5. Read the text and note down the differences between two different types of testing.

Testing and Acceptance

No system is truly worthwhile unless it meets the needs of the people for which it was designed. Therefore, once a system is debugged, it goes into testing so that people can see how it works. There are two types of testing:

- **Alpha testing** involves entering various kinds of data to see how the program reacts under different conditions. These tests are normally conducted “in-house”,

- by the people who created the system, whether they are working in a company developing its own application or for a software publisher developing a commercial application.
- **Beta testing**, which presumably follows the initial alpha testing, involves users testing, involves users testing the system under actual working conditions – but prior to its going into production. They not only look for system malfunctions, but also for such things as ease of use, how quickly the system performs its tasks, and a number of design characteristics.
- In beta testing, users are often asked to try to cause the system to fail by performing unanticipated functions – for example, opening the same file repeatedly without closing the previous one. Remember, a system should not only work as designed, it should not fail even when used improperly. When this occurs, the system should give the user an error or help message suggesting a course of corrective action.
- When testing is finished and the software is ready for use, or released to production, it is given a **version** number. The first release version is numbered 1.0. Interim improvements are numbered in hundredths or tenths, such as 1.03 or 2.4.

6. Read the text and explain the importance of maintenance.

Maintenance

Once accepted by the users, the system goes into production, which means it is in daily use. That does not, however, mean it is perfect. Most systems are constantly corrected, updated, and improved; this ongoing phase of the system life cycle is called maintenance. The users might ask that the system run faster or perform more tasks. Changing business procedures or conditions might necessitate updating or modifying the system.

Since the system is not perfect, subtle bugs may reveal themselves after the system is in use, such as during period of high-volume usage or during unanticipated types of use. Regardless of the reasons, far more is put into systems maintenance than systems design. Whether the software is a corporate-wide inventory control system or a commercial product such as a new spreadsheet, maintenance and support are essential.

7. Read the text and describe different forms of documentation.

Documentation

Documentation is the set of instructions that accompanies a system or an application. There are three kinds of documentation: software, user, and reference. They are differentiated by the people who use them.

Software documentation is chiefly for programmers who will maintain the program. **User documentation** and **reference documentation** are for the users who work with

the program. Software documentation explains how a program works. User and reference documentation explains what a program does and how to use it.

Writing the documentation is the final step in the system development life cycle, but ideally it is a process that continues throughout development. Even though the final details cannot be written until the programming is finished, waiting until the end of the project to begin writing often results in poor documentation. Good documentation is no accident; it is the result of careful planning and development, just like the software itself. Documentation can take many forms, including conventional paper manuals or memos, on-line electronic versions, or context-sensitive help screens or messages that appear when summoned by pressing the Help key. In fact, the user often contributes to producing the system's documentation, both during and after development.

Библиотека БГУИР

Учебное издание

Субботкина Ирина Григорьевна
Василенко Юрий Михайлович
Касперович Наталья Григорьевна
Рогачевская Анна Ивановна

Методическое пособие
по просмотровому чтению
на английском языке
для студентов 2-го курса ФКСиС и ФИТиУ

Корректор Е.Н Батурчик

Подписано в печать		Формат 60x84 1/16.
Бумага	Печать	Усл.печ.л. 2,5.
Уч. – изд. л.	Тираж 800 экз.	Заказ

Издатель и полиграфическое исполнение;
Учреждение образования
“Белорусский государственный университет информатики и радиоэлектроники”
Лицензия ЛП № 156 от 05.02.2001.
Лицензия ЛВ № 509 от 03.08.2001
220013, Минск, П.Бровки, 6