

M O D U L A R   S Y S T E M

Introduction to  
**COMPUTERS**

Osman AY  
Muammer ÖKSÜZ  
Osman BOZDAĞ



[www.zambak.com](http://www.zambak.com)

Copyright © 2003 Zambak Basım  
Yayın Eğitim ve Turizm İşletmeleri  
Sanayi Ticaret A.Ş.

All rights reserved.

No part of this book may be  
reproduced, stored in a retrieval  
system, or transmitted in any form of  
recording without the prior written  
permission of the publisher.

**Digital Assembly**

Zambak Typesetting & Design

**Page Design**

Murat ALTINDAĞ

**Publisher**

Zambak Basım Yayın Eğitim ve Turizm  
İşletmeleri Sanayi Ticaret A.Ş.

**Printed in**

İstanbul - TURKEY

**ISBN**

975-6402-50-4

**DISTRIBUTION**

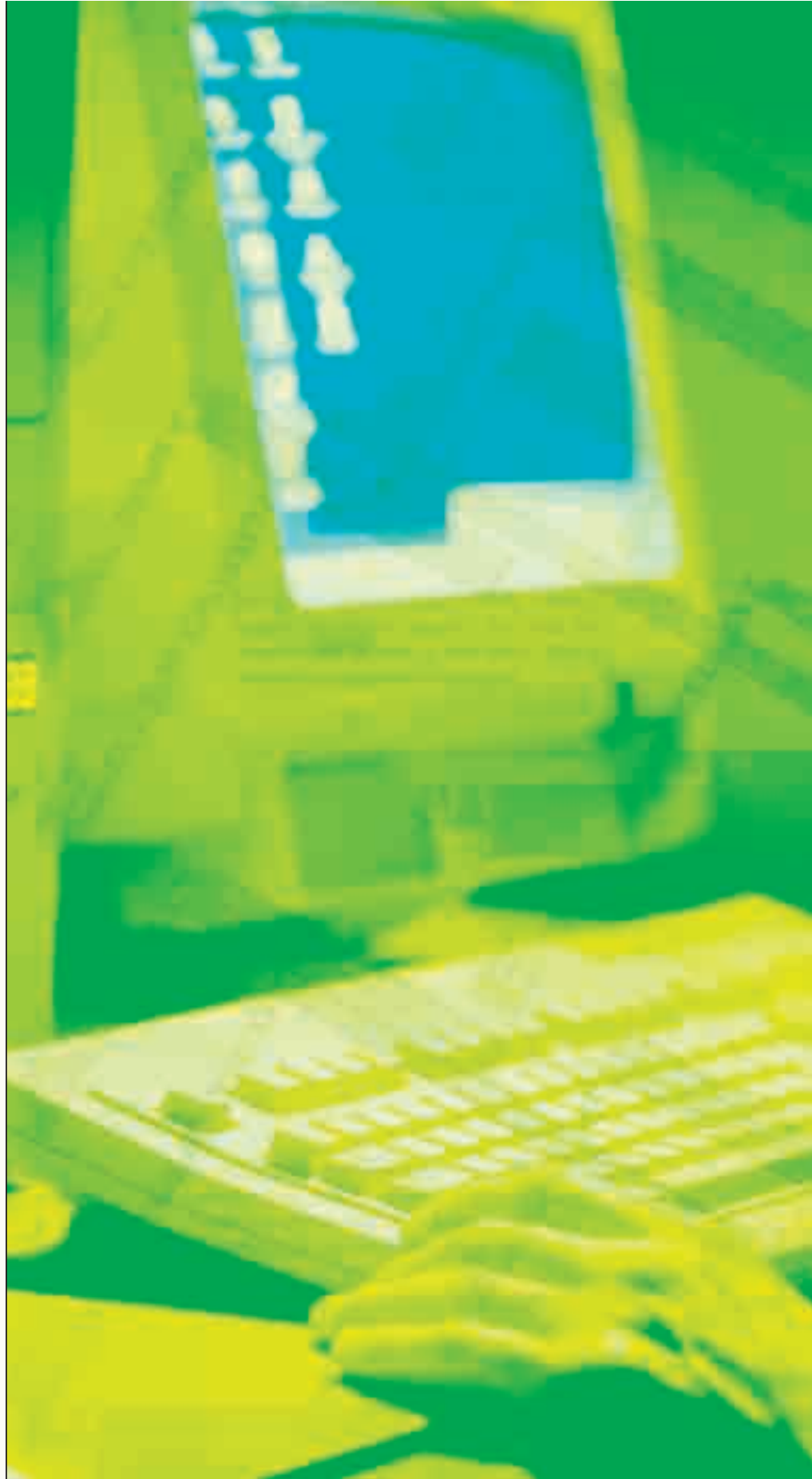
ZAMBAK YAYINLARI

Bulgurlu Mah. Bağlar Sok. No. 5  
81190 Üsküdar / İSTANBUL

Tel : +90-216 522 11 30 (pbx)

Fax : +90-216 522 11 44

[www.zambak.com](http://www.zambak.com)



# CONTENTS

## BASIC CONCEPTS

What is a Computer? .....	6
How Do Computers Work? .....	6
Types of Computer .....	7
Mainframe Computer .....	7
Minicomputer .....	7
Super Computer .....	7
Microcomputer .....	7
The History of Computers .....	7
Important Stages in the History of Computers .....	8
Computers in Everyday Life .....	10
Astronomy and Space Technology .....	10
Press and Publishing .....	10
Engineering, Architecture and Design .....	10
Finance and Accounting .....	10
Biology and Medicine .....	10
Banking .....	10
Entertainment .....	10
Communication .....	11
Education .....	11
The Military .....	11
Measuring Data: Bits and Bytes .....	12
Taking Care of Your Computer .....	12
Using Your Computer .....	13
Buying a Computer .....	14
<b>QUESTIONS</b> .....	16

## HARDWARE

The Physical Parts of a Computer .....	18
System Unit .....	18
Chassis .....	18
Mainboard .....	19
Central Processing Unit (CPU) .....	20

Memory (RAM) .....	20
IDE Controllers .....	21
PCI Bus .....	21
Graphics .....	21
SCSI .....	21
Video Card (Video Adapter) .....	22
Power Supply .....	22
Sound Card .....	22
Network Interface Card (NIC) .....	22
Modem (Modulator/Demodulator) .....	23
TV Card .....	23
PC Card .....	23
<b>Input Devices</b> .....	24
Keyboard .....	24
Mouse .....	28
Scanner .....	28
Microphone .....	28
Joystick .....	28
Light Pen .....	29
Touch Screen .....	29
WebCam .....	29
Digital Camera .....	29
<b>Output Devices</b> .....	30
Monitor .....	30
Printer .....	30
Plotter .....	31
Speaker .....	31
<b>Storage Devices</b> .....	31
Hard (Fixed) Disk .....	31
Floppy Disk .....	32
CD-ROM .....	33
DVD-ROM .....	33
Zip Disk .....	33
Magnetic Tape .....	33

## SOFTWARE

### Types of Software ..... 36

### Operating Systems..... 36

MS-DOS .....	37
PC-DOS.....	37
Microsoft Windows 9x and Windows Me.....	37
Mac OS .....	38
OS/2 .....	39
UNIX.....	39
Novell NetWare .....	39
Linux.....	39
Windows NT .....	40
Windows 2000 .....	40
Windows XP .....	40
BeOS.....	41

### Application Programs ..... 41

Word Processors .....	41
Spreadsheets .....	42
Presentation Software .....	43
Database .....	43
CAD/CAM .....	43
Painting .....	44
Drawing .....	44
Page Layout & Publishing .....	44
The Internet .....	45
Multimedia .....	45
Utilities .....	46
Antivirus Software .....	46
Games.....	46

### Programming Languages..... 47

Assembly.....	48
Basic .....	48
Fortran .....	49
Pascal .....	49
C .....	49
C++.....	50
Java .....	50
ASP (Active Server Pages) .....	50

COBOL .....	51
Visual Basic.....	51
Delphi.....	51
Visual C++ .....	51

## MS-DOS

### What is DOS?..... 54

### How to Run DOS? ..... 54

### Basic Concepts..... 54

### Internal and External Commands..... 57

Working with Disks.....	58
Working with Directories .....	62
Working with Files .....	64
Some Additional Commands .....	67

### Memory Usage ..... 69

### The DOS Boot Sequence..... 69

### The AUTOEXEC.BAT and CONFIG.SYS files . 70

AUTOEXEC.BAT file.....	70
CONFIG.SYS file .....	72

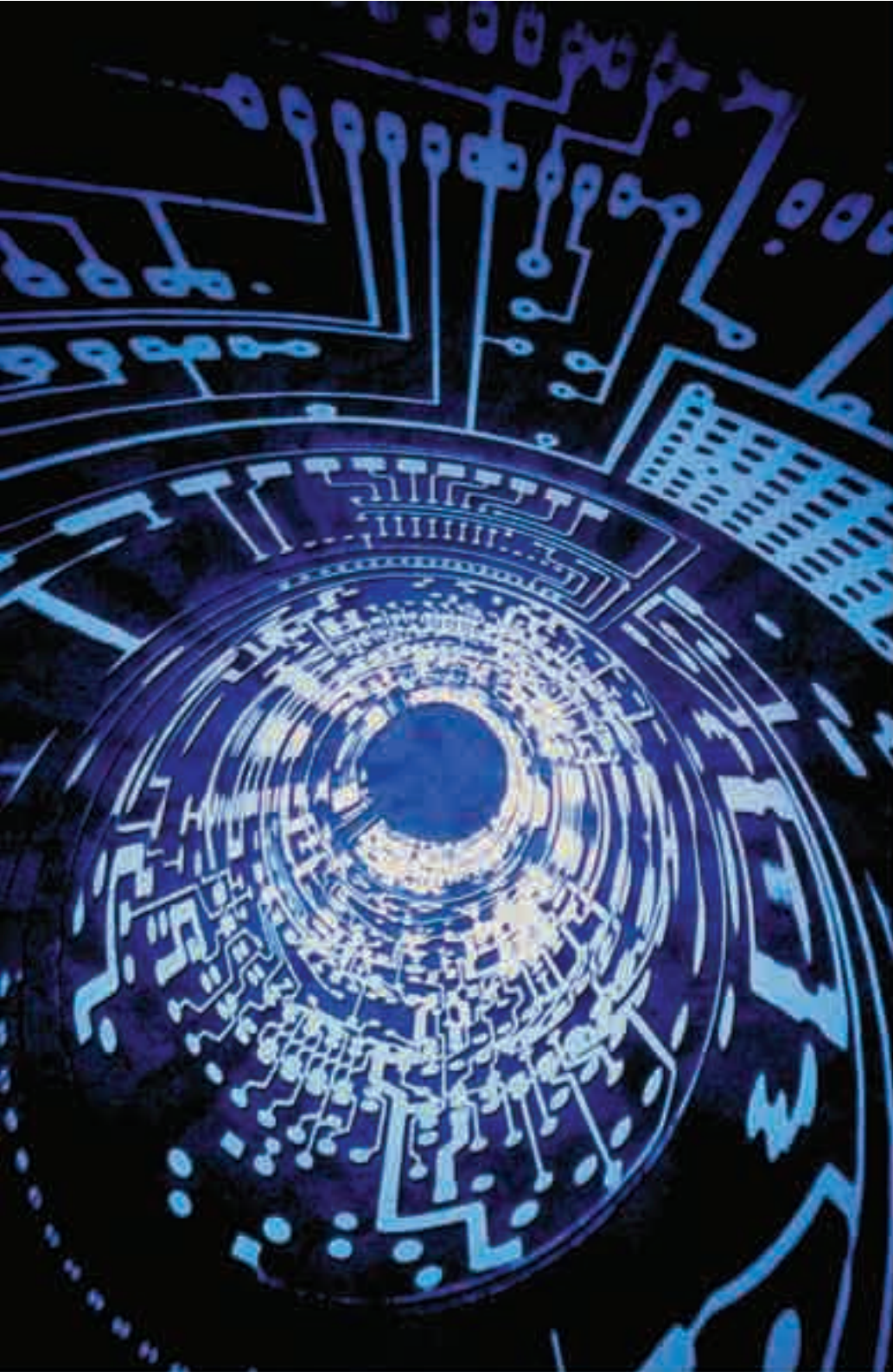
### Getting Help..... 72

### SOME DOS ERROR AND WARNING MESSAGES..... 74

### REVIEW QUESTIONS & PRACTICES .. 76

### INDEX..... 79





# CHAPTER

# 1

**What Is a Computer?**

**How Do Computers Work?**

**Types of Computer**

**The History of Computers**

**Important Stages in the History  
of Computers**

**Computers in Everyday Life**

**Measuring Data: Bits and Bytes**

**Taking Care of Your Computer**

**Using Your Computer**

**Buying a Computer**

# BASIC CONCEPTS

## What Is a Computer?

A computer is an electronic machine that makes mathematical calculations and logical comparisons quickly and without any mistakes. Computers take information (called data), process it, and show the results of the processing.

They can store the results forever. For these reasons, computers have become a part of our lives.



A Desktop Computer

Computers consist of two parts, hardware and software. Hardware is the physical parts of the computer. Software is the programs in the computer. Software uses hardware to perform operations for the computer user. The relation between hardware and software is like the relation between our body and our spirit.

## How Do Computers Work?

Computers can store information in two different ways: in permanent storage (for example, on a disk or a CD), and in temporary storage, also called the computer's memory, or RAM. Data in temporary storage only lasts as long as the computer is switched on. This is why the storage is called temporary.

When you switch on a computer, first a special piece of software called the operating system is copied (loaded) from permanent storage to the RAM. The computer gets data from an input device such as a keyboard, mouse, hard disk, or scanner, and makes all the calculations and the comparisons in the

central processing unit (CPU). The CPU is like the computer's brain. It uses the RAM to maintain the data. When the CPU has processed the data, it sends the results to an output device such as a monitor, hard disk, or printer.

When you switch a computer off, the computer copies any important data in the RAM back to permanent

Put a tick (✓) to show if the statements are true or false.

STATEMENT	TRUE	FALSE
a. Computers make calculations very fast.		
b. Computers can compare numbers, such as $10 > 5$ .		
c. Computers can ride a bicycle.		
d. Computers are intelligent machines.		
e. Computers don't forget.		
f. Computers can draw pictures.		
g. Computers know how to swim and can swim.		
h. Computers need food to work.		
i. Computers are a kind of TV.		

storage.

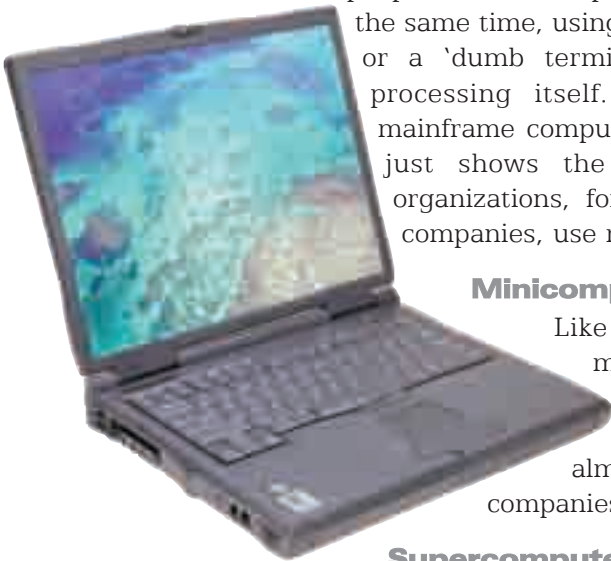
## Types of Computer

### Mainframe Computers

A mainframe computer is a big, powerful, and expensive computer. Many people can use the power of a mainframe computer at the same time, using either a PC (personal computer) or a 'dumb terminal'. A PC performs a lot of processing itself. A dumb terminal uses the mainframe computer to do all the processing, and just shows the results on a screen. Large organizations, for example banks and insurance companies, use mainframe computers.



**A Mainframe Computer**



**A Laptop Computer**

### Minicomputers

Like mainframe computers, minicomputers are very powerful and expensive. Mainframes and minicomputers are used for almost the same things. Mid-sized companies use minicomputers.

### Supercomputers

A supercomputer is an incredibly powerful computer with a very big capacity for processing data. Supercomputers are often used by the military. They are also used for research and for things such as weather forecasting, where a huge amount of data has to be processed rapidly.

### Microcomputers

Microcomputers are usually only used by one person at a time. An IBM PC and Apple Macintosh are two kinds of microcomputer. There are desktop, laptop, palmtop, pocket, and tablet models of microcomputers.

## The History of Computers

The electronic computer industry has developed faster than any other industry in history.

The first electronic computer was called the ENIAC (Electronic Numerical Integrator And Calculator). It was built at the University of Pennsylvania in 1943, and it was used for military calculations, for weather forecasting, and for atomic energy calculations. It weighed 30 tons and it filled a big room.

Dr. John von Neumann invented a technology for program storage at the





An Abacus

University of Princeton in 1945. This technology allowed a computer to store a program in memory. People could change the program for different purposes. Dr. John von Neumann’s computer made it possible to develop the computers we use today.

There are five main periods in the history of computers. They show how the technology that computers use for processing data has changed and developed.

- 1. Vacuum Tubes (1930–1958):** The first computers used vacuum tubes to make calculations. The ENIAC was a vacuum tube computer.
- 2. Transistors (1959):** Transistors replaced vacuum tubes because they are smaller, faster, and use less energy.
- 3. Integrated Circuits (1965):** Integrated circuits use semiconductors to make complex circuits for data processing. This was a big development for the computer industry. Big boards with transistors which took up a lot of space were replaced with small boards that reduced the size of computers and made them more reliable, and less expensive.
- 4. Microprocessors (1971):** The computer company Intel introduced its

Match the statements to compare computers and humans.

COMPUTERS	?	HUMANS
1. A computer never gets tired and can work continuously.	d	a. A human is not a machine.
2. A computer is an electronic machine.		b. A human performs mathematical and logical operations slowly.
3. Computers need electricity to work.		c. The storage capacity of a human is very high.
4. Computers perform arithmetic and logical operations very fast and without mistakes.		d. Humans can only work continuously for a number of hours.
5. A computer cannot think, its IQ is zero.		e. Humans can think, and they have some IQ.
6. Computers can be classified by their configurations.		f. Humans need food and water to work.
7. Computers have a limited storage capacity.		g. Each human being is different.

first microprocessor in 1971. Microprocessors allow computers to perform more accurate operations in less time.

**5. PC (1981):** The computer company IBM introduced its first personal computer, called the Datamaster, in 1981.

#### Important Inventions in the History of Computers

**3000 BC:** People began to use an abacus for calculations.

**1642:** Blaise Pascal made a mechanical calculator for his father to calculate



Cray1 Computer



taxes. This calculator sometimes gave incorrect results.

**1670:** Gottfried von Leibnitz improved Pascal's calculator. Leibnitz's calculator could perform four arithmetical operations and square root operations correctly.

**1842:** Charles Babbage made a machine (called Difference Engine) that could solve more complex problems than Leibnitz's calculator.

**1890:** Hermann Hollerith designed a computer that used punched cards.

**1939:** John Vincent Atanasoff developed the first electronic digital computer.

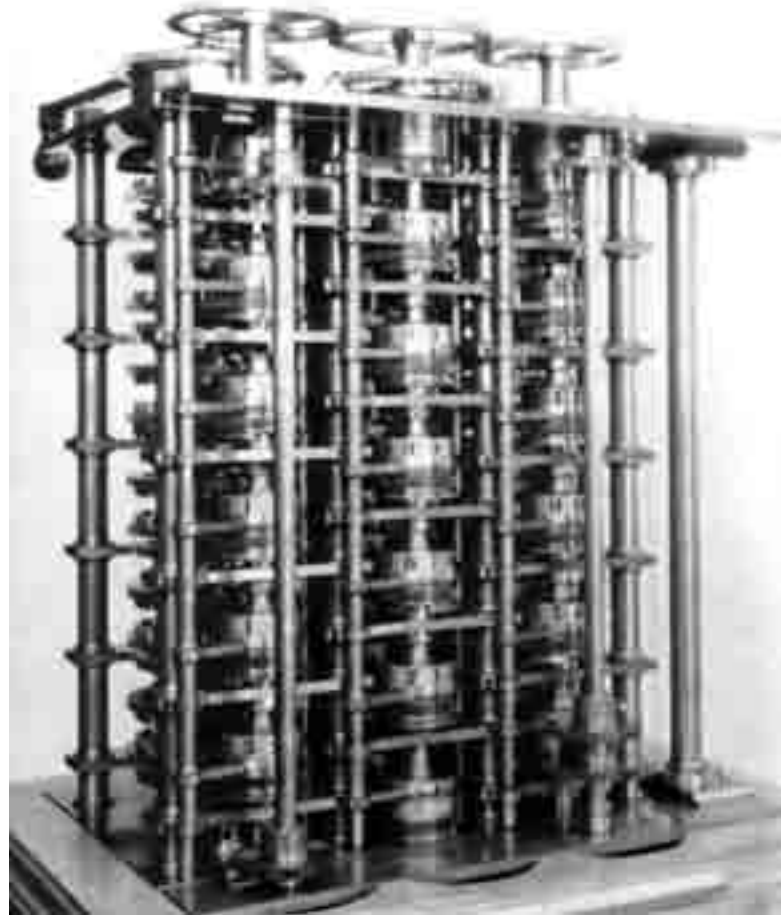
**1943:** J. Presper Eckert and John Mauchly created the ENIAC. People say that the ENIAC is the first real computer.

**1946:** John von Neumann found a way to store a program in a computer's memory.

**1951:** J. Presper Eckert and John Mauchly developed the first general-purpose commercial computer, the UNIVAC.

**1958:** Seymour Cray started to use transistors in computers.

**1964:** IBM used integrated circuits in the IBM 360 computer.



Difference Engine

Find an abacus and learn how it is used. Use your abacus to perform the calculations.

$$3 + 4 = ?$$

$$8 + 9 = ?$$

$$15 + 27 = ?$$

$$85 + 145 = ?$$

$$1853 + 3945 = ?$$

$$2 * 3 = ?$$

$$9 * 7 = ?$$

$$15 * 45 = ?$$

$$6 - 4 = ?$$

$$60 - 15 = ?$$

$$6 / 4 = ?$$

$$97 / 12 = ?$$

Find some more information and pictures about important people and machines in the history of the computers. Put the pictures on the wall.

**1971:** Intel introduced the first microprocessor.

**1975:** The first microcomputer, called the Altair, was introduced.

**1981:** IBM introduced its first PC.

**1984:** Apple introduced the first Macintosh.



Find five people who use computers at work. Complete the table with the information you find.

NAME & SURNAME	JOB	USES A COMPUTER FOR...
John Smith	English teacher	Keeping a list of students, with their grades, absences, and comments. Preparing presentations, quizzes, and exams. Showing visual materials in lessons.

## Computers in Everyday Life

### Astronomy and Space Technology

Astronomy and space technology need complex and precise calculations. Without computers, it would have been impossible for humans to go into space, to put satellites in orbit, and to study and follow planets, stars, comets, and meteors.

Mistakes made by computers have caused big losses in space work. For example, some years ago, space scientists lost the satellite Clementine in space because of a mistake in a computer program.

### Press and Publishing

Preparing books, newsletters, and magazines has become easier with computers. Writers, designers, and publishers can prepare and store their work on a computer.

### Engineering, Architecture and Design

Engineers can prepare plans quickly and easily using CAD (Computer-Aided Design) programs. They can print their plans from a computer and share them with other people.

### Finance and Accounting

Finance and accounting need fast and accurate calculations. Computers help companies to manage money and make good financial decisions.

## Biology and Medicine

Today, computers control almost all of the medical machines used in hospitals and for research. These machines help us to discover and cure illnesses much faster. For example, the Human Genome Project is an important research project that is using computers to find a map of the human genome.

1 byte	$2^3$ bits	8 bits
1 kilobyte (KB)	$2^{10}$ bytes	1024 bytes
1 megabyte (MB)	$2^{20}$ bytes	1024 kilobytes
1 gigabyte (GB)	$2^{30}$ bytes	1024 megabytes
1 terabyte (TB)	$2^{40}$ bytes	1024 gigabytes
1 petabyte (PB)	$2^{40}$ bytes	1024 terabytes
1 exabyte (EB)	$2^{60}$ bytes	1024 petabytes

## Banking

Banks benefit from computer technology more than any other kind of company. Banks can store account information and perform banking operations using computers. Bank customers can use a computer to access their bank account from home.

## Entertainment

Many people use computers to play games, listen to music, watch movies, or share jokes with their friends. Multimedia computers are

special computers for listening to music and watching movies. There are also special game computers such as PlayStation, Dreamcast, and Xbox.

## Communication

The Internet has made big changes in communication. Today, people can send e-mails, voice messages, and video clips to each other in seconds. They can also have typed conversations (chat) with other Internet users all over the world.

## Education

A scientific investigation has shown that education will be quite different in the 21st century with CBET (Computer-Based Education and Training). Research into CBET shows that computers can:

- improve the quality of education.



Keep your computer clean





help students to learn faster.

- ☐ help students to study in groups easily.
- ☐ help students to obtain information faster, more easily, and more cheaply.
- ☐ make administration tasks easier in schools. For example, preparing a timetable for a school takes just a few minutes with a computer.
- ☐ help parents to follow their children's grades using the Internet.

### The Military

The military use very powerful computers to control missiles and satellites, and decide about military targets. They also use computers to train airplane pilots with special simulation programs.

### Measuring Data: Bits and Bytes

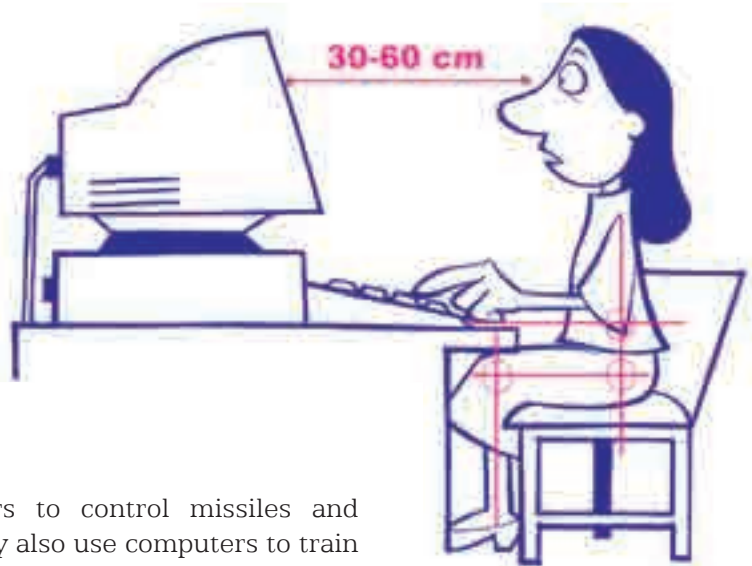
We measure computer information (data) in bits and bytes. 'Bit' is short for 'binary digit'. It is the smallest unit of information that a computer can understand. One bit represents a 1 or 0 digit in a binary numeral, or a true or false logical condition. A bit is represented physically by a high or low voltage in a circuit or a small magnetized spot on a disk. A human probably wouldn't find the information in one bit of data very useful.

'Byte' is short for 'binary term'. A byte usually contains eight bits. It can represent a single character, such as a letter, a digit, or a punctuation mark. Because a byte represents only a small amount of information, we usually measure amounts of computer memory and storage in kilobytes (one kilobyte is 1024 bytes), megabytes (one megabyte is 1048576 bytes), or gigabytes (one gigabyte is 1073741824 bytes).

### Taking Care of Your Computer

Computers are very powerful, but they need proper care. Follow these rules to keep your computer working correctly.

- ☐ Keep your computer clean and dry, and away from direct sunlight.
- ☐ Keep your computer away from heat sources, such as electric heaters.
- ☐ Do not eat or drink near



your computer.

- ☐ Do not place the computer near objects that create strong magnetic fields, such as stereo speakers.
- ☐ Do not use a mobile phone when you are near your computer.
- ☐ Type gently on the keyboard. Do not hit the keys too hard.
- ☐ Never put anything except your disks into the disk drives.



Using Your Computer

When you use a computer, your body can get tired. Follow these rules to stay comfortable and healthy in front of your computer.

Find the words in the wordsearch puzzle. Do you remember what each word means?



COMPUTER  
CPU  
RAM  
MAINFRAME  
PC  
CAD

MAIL  
ENIAC  
TRANSISTOR  
ABACUS  
PASCAL  
DISK

MONITOR  
SOFTWARE  
HARDWARE  
BIT  
BYTE  
KILOBYTE

MEGABYTE  
CALCULATION

B	I	T	A	N	S	U	C	A	B	A	E	N	P	U
Y	T	D	E	V	I	T	C	E	F	O	D	A	C	R
T	C	H	Q	C	O	R	P	X	U	K	G	A	A	K
E	P	A	M	S	H	A	L	O	K	S	L	S	M	S
Y	U	R	O	T	I	N	O	M	R	C	A	N	D	I
O	M	D	A	T	Y	S	P	E	U	S	O	F	M	D
E	M	W	E	M	A	I	L	L	R	S	E	B	U	R
T	E	A	M	F	S	S	A	B	A	D	P	S	I	I
Y	G	R	A	R	E	T	U	P	M	O	C	R	E	V
B	A	E	R	Z	I	O	Y	N	O	S	O	D	P	E
O	B	T	F	O	E	R	A	W	T	F	O	S	A	R
L	Y	E	N	I	A	C	Z	M	B	I	L	D	S	A
I	T	A	I	B	R	E	M	M	A	U	M	I	C	E
K	E	M	A	X	I	B	I	O	S	M	A	N	A	Y
C	E	N	M	G	A	D	Z	O	B	O	O	K	L	M



ENTERTAINMENT

- ❑ Put the computer on a flat table at a comfortable height and distance. Make sure that the display is a bit below your eye level, to avoid hurting your eyes.
- ❑ Put the computer so that it is directly in front of you when you work. Make sure you have enough space to operate the different parts of the computer (keyboard, mouse, etc.) easily.
- ❑ If you use a paper holder, put it at about the same height and distance from you as the monitor.
- ❑ Set your chair height so that the keyboard is at (or slightly below) the level of your elbow. You should be able to type comfortably with your shoulders relaxed.
- ❑ Your knees should be slightly higher than your hips. If necessary, use a foot rest to raise your knees.
- ❑ Set the back of your chair so that it supports the lower part of your spine.
- ❑ Sit straight so that your knees, hips, and elbows are at about 90 degree angles when you work. Do not lean forward or back too far.
- ❑ Put the computer so that sunlight or bright indoor light does not reflect off the screen and hurt your eyes.
- ❑ If possible, use soft, indirect lighting in your computer work area.
- ❑ Change your position often. If you use a computer for a long time, stand up and stretch your wrists, hands, and legs regularly.
- ❑ Every fifteen or twenty minutes, look at an object that is far away, to avoid hurting your eyes with too much close work.
- ❑ Take frequent short breaks (for example, two or three minutes every half hour) instead of one or two long breaks.
- ❑ Have regular eye examinations. Visit a doctor if your body hurts or aches because of too much computer work.



## Buying a Computer

One day you might want to buy your own computer. There are many different types of computer to choose from. Here is a list of some important things to think about if you are choosing a computer.

**Your needs:** What do you want to do with your computer? For example, if you want to play music and games, you should buy a multimedia computer. If you want to use the Internet, your computer needs a modem or network connection.

**Memory (RAM):** Your computer should have enough memory to run your applications. Make sure that it is possible to add new RAM modules or replace existing RAM modules with larger ones.

**Hard Disk:** Your hard disk should be big enough to store all your programs, documents, pictures, music, and movies.

**Monitor:** Find a monitor size to suit your needs. If you want to do multimedia design, you might prefer a bigger screen.

**Disk Drives:** Your computer should have at least one floppy disk drive and one CD-ROM drive. If you want, you can add a DVD-ROM drive or a CD writer.

**Sound:** If you want to listen to music, watch movies, play games, or make your own music, movie or sound effects, you will need a high quality sound card and speakers.

**Speed:** The speed of the microprocessor has a big effect on your computer's speed. However, other parts of the computer (for example the RAM, disk drives, and the mainboard) also affect the speed of a computer. Choose good quality parts if you want good computer speed.

**Cost:** When you buy a computer, think about the relationship between price and performance. If you buy a very cheap computer, you might not be able to run all your programs. However, don't pay extra money for power or parts that you probably won't use.

**Software:** Your computer should be able to run the programs that you need at the moment and in the near future. Good software will help you to get the best performance from your computer.

Finally, remember that computers are always changing. Today's latest computers may be out of date in a few years and your computer will no longer be good enough for you. Choose a good quality computer so that you can change each part as you need to.

# QUESTIONS

1

What is a computer?

2

What is a calculator?

3

What are the differences between a calculator and a computer? Which one is more useful?

4

For each expression below, write the result and determine whether it is an arithmetical or logical expression.

EXPRESSION	RESULT	ARITHMETICAL	LOGICAL
$5 + 7$	12	✓	
$4*(8 - 3)$			
$5 > 7$	FALSE		✓
The earth is bigger than the moon			
$\text{sqrt}(\text{sqrt}(X)) \geq X$			

# CHAPTER 2

**The Physical Parts  
of a Computer**

**System Unit**

**Input Devices**

**Output Devices**

**Storage Devices**



# HARDWARE

## The Physical Parts of a Computer

The physical parts of a computer are called hardware. In this chapter, we will divide the different types of hardware into four groups: the system unit, input devices, output devices, and storage devices.

The system unit contains the main components of the computer, such as the mainboard, CPU, RAM, video card, hard disk, disk drives, and the power supply. It can also contain optional components such as a sound card or a network card.

We use input devices to give data to the computer. The most common input devices are the keyboard and the mouse. Other types of input device are a scanner, joystick, light pen, touch screen, webcam, and digital camera.

Output devices are the components where the computer shows the results. A printer, plotter, and loud speaker are all output devices.

Storage devices are used to store data permanently. A hard disk, floppy disk, CD-ROM, DVD-ROM, Zip disk, and tape cartridge are examples of storage devices.

Some hardware parts (such as the CPU, mainboard, RAM, power supply, keyboard, graphics card, and hard disk) are necessary for computer to work. Some parts are optional and simply increase a computer's functionality. A printer, a modem, and a network card are examples of optional components.



Back, Side, and Front Views of a Computer Chassis

## The System Unit

All of the main components of a computer are grouped together in the system unit. For instance, the system unit includes the computer system's motherboard (including the processor), and items such as hard disks, floppy disks, and CD-ROM drives, etc.

### Chassis

The chassis is the metal and plastic box that contains the system unit. Most people don't think that the chassis is an important part of the computer. However, it is not just the shell of your computer, it supports all the internal parts. It also protects your system from the outside world and helps to keep the system unit components cool. The closed design and good air flow inside the chassis are especially important for components such as the CPU and hard drive, which can get very hot when they are working.





## Mainboard

The mainboard (also called the motherboard, or system board) is the biggest board inside your system unit. All the main components of your computer connect to the mainboard. The CPU is normally situated on your mainboard along with all the other electronic components. All the other boards (cards) in your computer connect to the mainboard. Other items, such as the hard disk, are attached to the mainboard either directly or via cables. Mainboards are getting smaller and smaller as the components become more integrated. Nowadays, if you open up a system unit it can look quite empty.



**A Mainboard**

The ROM-BIOS (Read Only Memory-Basic Input Output System) chip is a special microchip on your computer's mainboard. It contains software that allows your computer to work with your operating system. For example, it copies your operating system into RAM when you switch on your computer.

Buses are data paths on the motherboard that connect the CPU to the different parts of the mother board, such as the chips and cable connections.

Expansion slots are sockets on the mainboard which allow you to extend the computer's features and capabilities. Expansion slots hold expansion cards (such as a video card, sound card, or network card) and connect them to the buses. Laptops and other portable computers use special expansion slots called PCMCIA slots, which accept small expansion cards called PC Cards.

Serial ports are sockets located at the back of your computer that allow you to connect items such as modems to the computer. Serial ports are commonly labeled COM1 or COM2.

Parallel ports are sockets located at the back of your computer that enable you to connect items such as printers to the computer. Parallel ports are commonly labeled LPT1 or LPT2.

PS/2 keyboard and mouse ports are used to connect a keyboard and mouse to the mainboard.

A battery on the mainboard is needed to store some important information (such as the date and time, and maybe a user password) while your computer is switched off.

An internal speaker connected to the mainboard allows your computer to send you error or warning beeps while it is running.

The USB (Universal Serial Bus) is quite a new item inside a PC. USB ports are located at the back of the system unit. They allow you to plug in devices designed for the USB such as scanners, digital cameras, and printers.

The bus arbitrator (chipset) is an integrated circuit on the motherboard. It controls how the mainboard buses are used. If two different devices try to use the same bus at the same time, there can be a problem. The bus arbitrator prevents this problem.

Bus Type	Bus Width	Bus Speed	MB/sec
ISA	16 bits	8 MHz	16 MBps
EISA	32 bits	8 MHz	32 MBps
VL-bus	32 bits	25 MHz	100 MBps
VL-bus	32 bits	33 MHz	132 MBps
PCI	32 bits	33 MHz	132 MBps
PCI	64 bits	33 MHz	264 MBps
PCI	64 bits	66 MHz	512 MBps
PCI	64 bits	133 MHz	1 GBps

**Data Bus Specifications**

## Central Processing Unit (CPU)

The CPU (Central Processing Unit) is one of the most important components inside your computer. It is like the brain of your computer because it performs all the computer calculations. CPU speed is measured in gigahertz (GHz) and has an important effect on the overall speed of your computer.

The main CPU manufacturers today are Intel (8086, 80486, Pentium, Pentium Pro, Pentium-II, Pentium-III, and Pentium-IV processors), AMD (K6/2 and Athlon processors), Motorola (68000 and PowerPC G4 processors), VIA (C3 1 GigaPro processor), and TI.



Microprocessors

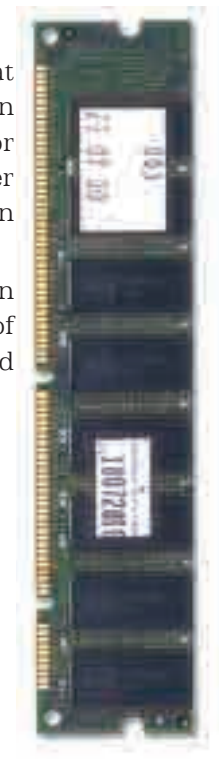
## Memory (RAM)

RAM (Random Access Memory) is temporary memory that the computer uses to store applications and data that are in use, for example, the operating system, and a word processor or database program. When you create data such as a letter or a picture, the computer stores the data in RAM and then copies it to the hard disk when you save your work.

If you have a lot of RAM, applications can run faster. When the amount of RAM is not enough for an application, a part of the hard disk is used as RAM. This part of the disk is called virtual memory.



"The secret to happiness is: Always get as much RAM as you can afford."



RAM

## IDE Interface

Storage devices such as floppy disk drives, hard disk drives, and CD-ROM drives usually connect to the computer through an IDE (Integrated Drive Electronics) interface. An IDE interface is a standard way for storage devices to connect to a computer. IDE is not the original technical name for the interface standard. It was originally called AT Attachment (ATA) technology, because engineers developed it for the IBM AT computer.

## PCI Bus

During the early 1990s, Intel introduced a new bus standard, the Peripheral Component Interconnect (PCI). A PCI bus connects the CPU, memory, and expansion slots on the mainboard. PCI is faster and more reliable than older bus technologies such as ISA.

A PCI bus can connect up to five expansion slots (external devices) to the CPU. Usually there is only one PCI bus on a mainboard, although some mainboards have more.



PCI Slots and an AGP Slot

## Graphics Card

Modern computers use a lot of graphics. Many operating systems use a graphical user interface (GUI) as the main interface between the user and the computer. You might also enjoy playing video games or creating 3D graphics and animation. In fact, if you use your computer for anything except basic office tasks, you probably use lots of graphics.

A graphics card in a modern PC can connect to the mainboard in one of several different ways:

- ☐ On-board - The graphics chips and memory are part of the mainboard.
- ☐ PCI - The graphics card plugs into the PCI bus.
- ☐ AGP - The graphics card plugs into a special slot designed especially for graphics devices. AGP (Accelerated Graphics Port) is a special bus technology that was developed by Intel as a way to improve the performance and speed of graphics hardware connected to a PC.

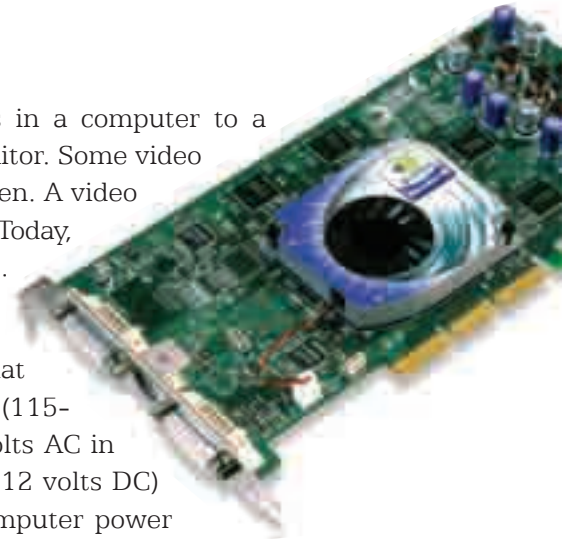
## SCSI Bus

Most home and small-office PCs use an IDE hard disk drive and have a PCI bus for adding components to the computer. However, a lot of computers, particularly expensive workstations and older Apple Macintosh computers, use a SCSI (Small Computer System Interface) bus to connect components such as hard disk drives, scanners, CD-ROM drives, printers and tape drives to the mainboard.

SCSI is basically a fast communication bus that allows you to connect multiple devices to your computer.

### **Video Card (Video Adapter)**

A video card converts the digital signals in a computer to a special format that can be displayed on a monitor. Some video cards also have a TV out to use a TV as a screen. A video card has its own microprocessor and memory. Today, the size of the memory is up to 128 megabytes.



**A Video Card**

### **Power Supply**

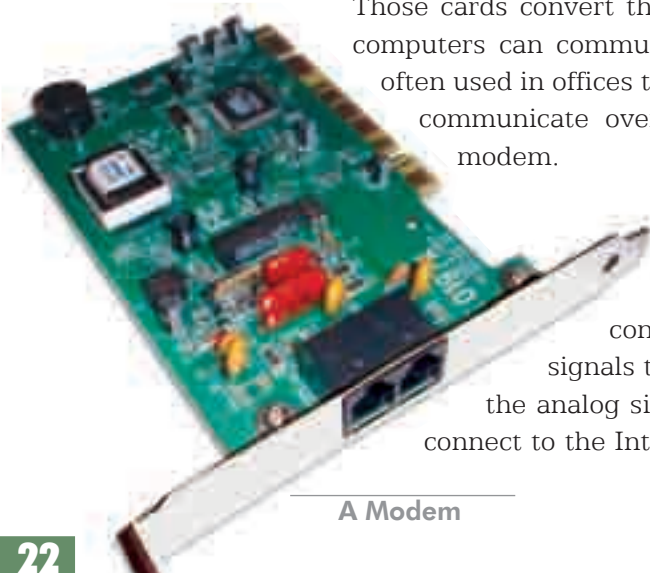
The power supply is an electrical device that transforms the standard electricity supply (115-120 Volts AC in the United States, or 220 Volts AC in Europe) into the lower voltages (3.3, or 5 to 12 volts DC) that computer systems require. Personal computer power supplies are measured in watts. They usually range from about 90 watts to 300 watts.

### **Sound Card**

A sound card converts digital sound signals to analog sound signals and sends them to the speakers so that you can hear sounds. If you have a microphone and suitable software, you can also record sounds. You can also buy special software called speech recognition software, which recognizes your voice and displays the words you say on your monitor. In the future, speech recognition software might replace the keyboard.

### **Network Interface Card (NIC)**

A network interface card allows computers to communicate with each other through cables. It converts digital signals to analog signals and sends these analog signals to other network interface cards in other computers. Those cards convert the analog signals back to digital signals. In this way, computers can communicate with each other. Network interface cards are often used in offices to connect computers in the same room or building. To communicate over longer distances, office computers usually use a modem.



**A Modem**

### **Modem (Modulator/Demodulator)**

A modem is a device that connects your computer to the telephone system. A modem converts digital data on your computer into analog signals that can be sent over a telephone line. It also converts the analog signals that it receives into digital data. If you want to connect to the Internet using a telephone line, you will need a modem.



Today’s modems have a speed of 56000 bits per second. Modems can be internal or external. An internal modem plugs directly into a slot on the mainboard. An external modem plugs into one of the computer ports at the back of your system unit.

**TV Card**

TV cards usually have two functions, TV decoding and TV tuning. The TV decoder transfers the picture that is on the screen to a TV. This is sometimes useful for business presentations. The TV tuner allows you to watch TV channels on the monitor so that your monitor becomes like a TV.

**PC Card**

A PC card is a small, credit-card-sized board that extends a computer’s ability, for example, by providing more memory, or working like a modem. PC cards are particularly useful for laptops and other personal computers which do not have room for full-size expansion cards. PC cards connect to the outside of a computer through a special socket, called a PCMCIA slot.

Number the statements in the correct order from one to seven, to describe how to send an e-mail.

	When your message reaches your friend’s computer, the analog signals are changed back to the digital signals that are now displayed on your friend’s computer.
	Type a message to your friend who also has a computer with a modem.
	This whole process is reversed as your friend types a message to you from his computer to yours.
1	Attach a modem to your computer.
	Your modem changes your message into analog signals that can travel through telephone lines to your friend’s house.
	Connect your computer to a telephone line.
	Your friend enjoys reading your message.

Put a tick (✓) to show if the statements are true or false.

STATEMENT	TRUE	FALSE
a. All the cards in a computer are connected to the motherboard.		
b. The CPU is like a computer’s brain.		
c. There are several motherboards in a computer.		
d. Motherboard, mainboard, and system board refer to the same device.		
e. The CPU is situated on the mainboard.		
f. The video card sends information to the monitor.		
g. All modems are internal devices.		

Follow the instructions to see what you have in your system unit. You will need a Phillips (cross) screwdriver.

1. Switch off your computer and unplug the power cable from the computer.
2. Open the chassis.
3. Take out the IDE cable between the CD-ROM drive and the mainboard.
4. Unplug the power cable from the CD-ROM drive.
5. Take out the CD-ROM drive.
6. Repeat steps 3, 4, and 5 for the hard disk.
7. Take out the other boards in the system unit.
8. Remove the RAM modules from the mainboard.
9. Remove the CPU from the mainboard.
10. Find the power supply.
11. Find the ROM-BIOS chip.
12. Find the battery.
13. Find the expansion slots.
14. Find the chipset (bus arbitrator).
15. Find the buses.
16. Find the internal speaker.
17. Find the parallel, serial, PS/2, and USB ports.
18. Reassemble your computer.
19. Check that your computer works properly.

## Input Devices



A Keyboard

### Keyboard

The keyboard is the most common way to enter information into a computer. Today, standard keyboards have 104 or 105 keys. An electronic circuit inside the keyboard transmits the code of a pressed key to the CPU.

Most of the keys on a keyboard are used to enter numbers, letters, and punctuation marks. There are also function keys (used for special functions in applications), keys for working with text and documents (for example, the Page Up and Page Down keys), and other keys used to make special key combinations (Alt and Ctrl).

### Function Keys

The function keys on a keyboard are labeled F1, F2, F3, and so on. They are located along the left side or across the top of the keyboard (or both). Function keys are used in application programs or by the operating system as a faster way to access certain features of the software. For example, pressing F1 when an application is running often displays a help screen.





### Enter Key

The Enter key (also called the Return key) is used to signal the end of an entered command or line of text, so that the computer can begin processing. In word processing programs, pressing the Enter key starts a new paragraph.



### Ctrl Key

The Ctrl (control) key is used with other keys to access special software functions faster. For example, in some word processing applications, pressing Ctrl+C (Ctrl with the C key) copies text.

### Spacebar

The spacebar is a long key on the bottom row of most keyboards that sends a space character to the computer.



### Arrow Keys

Most keyboards have four keys that are labeled with arrows pointing up, down, left, and right. Pressing an arrow key usually moves the cursor (the place where you enter text on the screen) or, in some programs, extends a section of selected text.



### Page Up Key

The Page Up key is a standard key (often labeled 'PgUp') on most computer keyboards. Its function changes in different programs. In word processing programs, pressing the Page Up key moves the cursor up to the top of the previous page, or up a specific number of lines.



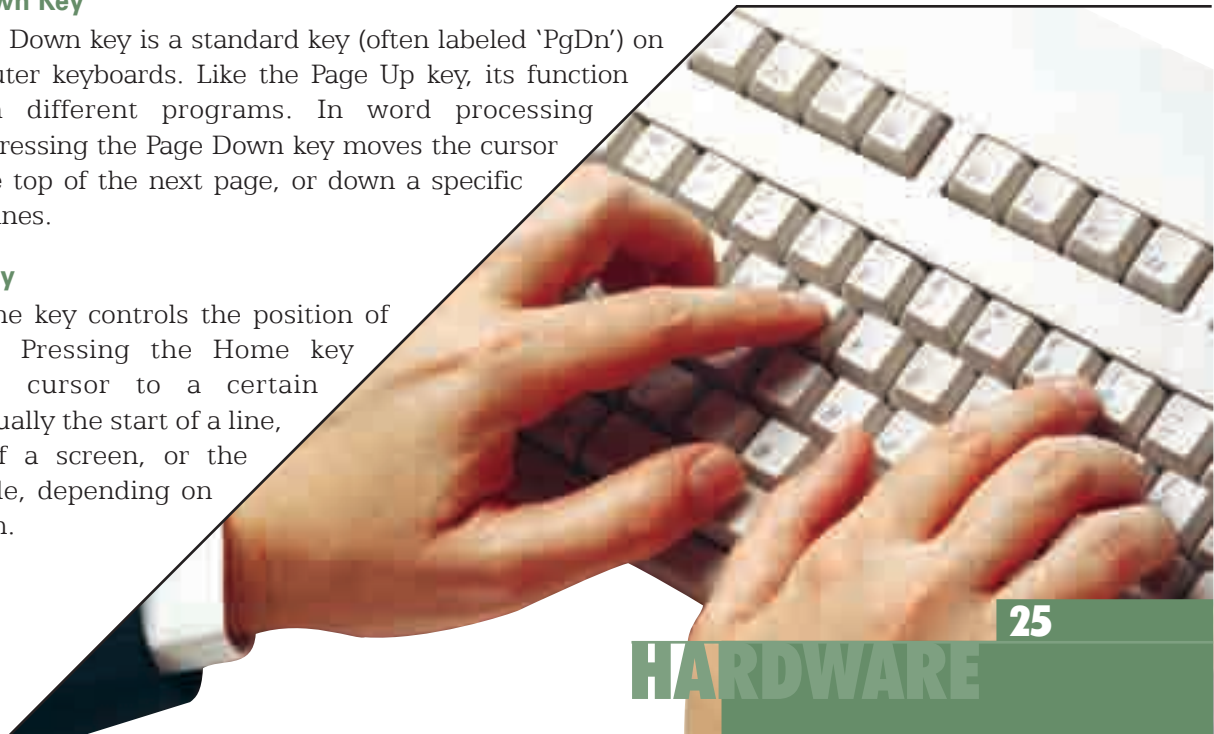
### Page Down Key

The Page Down key is a standard key (often labeled 'PgDn') on most computer keyboards. Like the Page Up key, its function changes in different programs. In word processing programs, pressing the Page Down key moves the cursor down to the top of the next page, or down a specific number of lines.



### Home Key

The Home key controls the position of the cursor. Pressing the Home key moves the cursor to a certain position, usually the start of a line, the start of a screen, or the start of a file, depending on the program.





### End Key

The End key also controls the position of the cursors. Pressing the End key moves the cursor to a certain position, usually to the end of a line, the end of a screen, or the end of a file, depending on the program.



### Caps Lock Key

The Caps Lock key changes the input from the keyboard letter keys between capital letters (A, B, C, etc.) and lower case letters (a, b, c, etc.). The Caps Lock key doesn't change the input of numbers, punctuation marks, or other symbols.



### Shift Key

The Shift key also changes the input from other keys. For example, pressing Shift with the A key makes a capital 'A' instead of a lower case 'a'. Pressing Shift with other keys makes punctuation characters and sometimes performs special operations.



### Backspace Key

Pressing the Backspace key moves the cursor to the left, one character at a time, usually erasing each character on the screen as it moves.



### Escape Key

In many applications, pressing the Escape key (labeled ESC or Esc) moves you back to a previous menu, or exits the application.



### Insert Key

The Insert key (labeled Insert or Ins) can perform different functions in different applications. In word processing applications, pressing Insert often changes between an overwrite mode (where typed characters delete the existing text) and a text or character insert mode.



### Pause Key

Pressing the Pause key temporarily stops the operation of a program or a command. The Pause key is used, for example, to stop text moving up the screen so that you can read a multiscreen listing or document.



### Print Screen Key

Pressing the Print Screen key usually makes a copy of the screen display and sends it to the printer. Some programs also use the Print Screen key to copy a screen image and save it on the hard disk.



### Tab Key

The Tab key, labeled with a left-pointing and a right-pointing arrow, is most commonly used in word processing programs to insert tab characters (long spaces) into a document. In other applications, the Tab key is often used to move the screen focus or cursor to different parts of the screen. Many database and spreadsheet programs allow you to press the Tab key to move around within a record or between table cells.



### Num Lock Key

The Num Lock key is also called the Numeric Lock key. Pressing Num Lock activates the numeric keypad on the right side of the keyboard so that you can use the keypad like a calculator, for entering numbers and calculations.

### Numeric Keypad

The numeric keypad is a set of number and symbol keys, which is usually on the right side of a keyboard. When the Numeric Lock (Num Lock) is on, the numeric keypad keys produce numbers on the screen. When the Numeric Lock is off, the numeric keypad keys move the cursor and the focus around the screen.



A Numeric Keypad



Draw your computer keyboard on a piece of paper. Take an article from an English newspaper. Count the number of times each letter occurs and write the numbers on the corresponding keyboard keys in your picture. Do you think the keyboard is well designed?

ACTIVITY



**A Mouse**

### Mouse

A mouse is another very popular input device, which is used to point to things and select things on the screen. A small ball underneath the mouse tells the computer when the mouse is moved across a surface, and the computer moves the on-screen pointer to follow.

There are usually two or three mouse buttons that you can press ('click') to choose commands and select things on the screen.

Two mouse clicks close together are called a 'double click'.

A mouse is called a relative pointing device because there are no limits to its movement, and because its position does not map directly to a position on the screen (for example, if you move the mouse by picking it up, the screen position doesn't change).



### Scanner

A scanner uses special light sensors to 'capture' (or photograph) an image and make a digital copy, for example on your screen. You can then use special text or graphics software to work with the scanned image. The most popular types of scanner are flatbed scanners (where the scanner moves the light sensors over the image), and handheld scanners (where a human moves the sensors over the image).



**A Flatbed Scanner**

### Microphone

A microphone converts sound waves into electrical signals that can be understood by your computer's sound card. The sound card converts the electrical signals into digital data that your computer can process. For example, you can use a microphone to store speech or music on your computer.

### Joystick

A joystick is another kind of pointing device, which is often used for computer games. A joystick has a base, usually with one or more control buttons, and a vertical stem, which can move in any direction to control the movement of an object on the screen. The buttons activate different software features.



A joystick is usually a relative pointing device, like a mouse: the object on the screen moves when the stem is moved, and stops moving when the stem is released. In industrial control applications, a joystick can also be an absolute pointing device, with each position of the stem mapped to a specific location on the screen.

### **Light Pen**

A light pen is an input device like a pen that is connected to a computer's monitor. You can use a light pen to select items and choose commands on the screen by pointing the pen at the screen, and then either pressing a clip on the side of the pen or touching the screen with the pen (the equivalent of performing a mouse click).

### **Touch Screen**

A touch screen is a computer screen which can recognize the location of a touch on its surface. You can touch the screen to make a selection or move a cursor. The simplest type of touch screen is made up of a grid of sensing lines, which sense the vertical and horizontal location of the touch. Touch screens are sometimes used in ATM (banking) machines.

### **Webcam**

A webcam is a small digital movie camera mounted on your PC monitor which allows you to exchange sound and video across the Internet in 'real time', i.e., as they are recorded.

### **Digital Camera**

A digital camera is a type of camera that stores photographed images electronically instead of on traditional film. A digital camera uses a special device to capture an image through the lens when you take a picture. The camera stores the image in a storage medium such as a hard disk, which is inside the camera. After the image has been stored, you can transfer it by cable to the computer using software supplied with the camera.



Joysticks



Digital Cameras

## Output Devices

### Monitor

A monitor, or computer screen, is a very common type of output device. A monitor displays images which have been generated by the computer's video card. The monitor is attached to the video card by a cable.

There are two main types of monitor: flat panel monitors, and cathode ray tube (CRT) monitors. A flat panel monitor uses a liquid crystal display (LCD) instead of a cathode ray tube to display data. Flat panel monitors occupy much less physical space than CRT monitors.



A 15" (Fifteen Inch) Monitor

### Printer

A printer is an output device that prints text and computer-generated images onto paper or onto another medium, such as transparent film. There are many different types of printer.

#### LASER PRINTERS



Laser printers produce high print quality at high speed. They are called [laser printers] because they have a small laser inside them.

#### INKJET PRINTERS



Inkjet printers use tiny jets to spray ink onto the paper. Inkjet printers are very quiet and produce print quality similar to laser printers, although laser printers are still faster.

Inkjet printers are ideal for people who want to print small numbers of high quality copies, where speed is not important, for example in a

#### DOT MATRIX PRINTERS



Dot matrix printers push a row of pins through an ink ribbon onto the paper. The print quality increases with the number of pins. Most modern dot matrix printers have 24 pins. Dot matrix printers are used for cheaper, low quality printing, for example, printing stock information in a factory.

**Plotter**

A plotter is an output device similar to a printer, but for larger images. Plotters use either pens, or electrostatic charges and special chemicals, to print an image. Pen plotters draw on paper or transparent film with one or more colored pens. Electrostatic plotters ‘draw’ a pattern of electrostatically charged dots on the paper, and then apply chemicals to keep the pattern in place.

**Speaker**

A speaker is an output device that plays sound generated by your computer’s sound card. The speaker is attached to the sound card by a cable. Most computers also have an internal speaker that is attached to the mainboard and which can play simple sounds.

**Storage Devices**

**Hard (Fixed) Disk**

Hard disks are the main large data storage area inside your computer. Hard disks are used to store your programs and data. They are much faster than most other types of storage device and can also hold much more data (up to 160 Gigabytes).

A hard disk is made up of platters. Platters are rigid disks made of metal or plastic. A platter is divided into sides (top and bottom), tracks (rings on each surface), and sectors (sections of each ring). Sectors are the smallest physical storage units on a disk. Usually, each sector holds 512 bytes of data. A set of two to eight sectors grouped together is called a cluster.

The computer reads information from the hard disk through a fixed sensor called the disk head. The hard disk platters spin round underneath the disk head so that the computer can read the data tracks. A hard disk drive has a speed between 4500 and 7200 rpm (revolutions per minute), which means that the platters spin round between 4500 and 7200 times every minute.

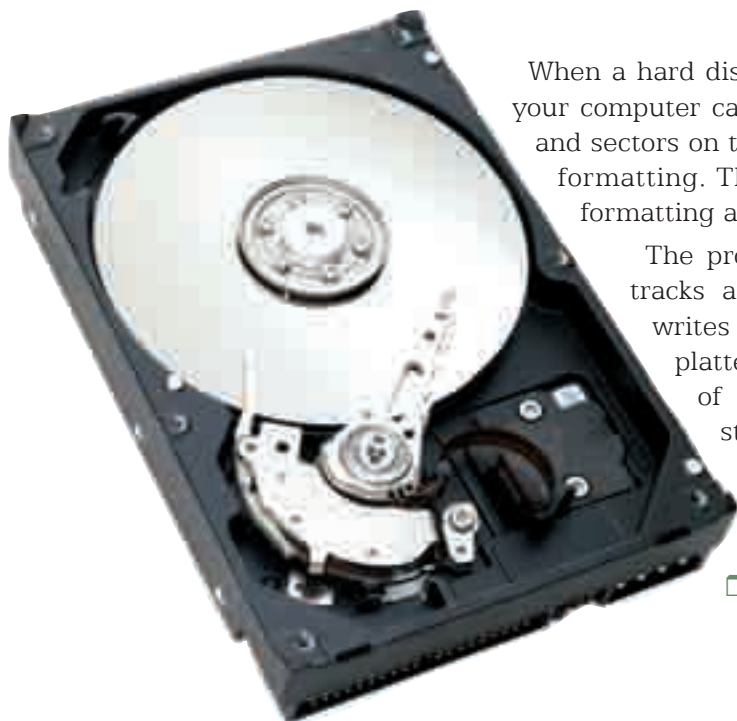
The boot sector is a special part of the disk that is used when the operating system starts. It contains a short machine language program that loads the operating system into RAM.

Put a tick (✓) to show if each device is an input device or an output device.

DEVICE	INPUT	OUTPUT
Keyboard		
Monitor		
Printer		
Mouse		
Scanner		
Joystick		
Microphone		
Speaker		
Floppy disk		
Plotter		
Touch screen		
Modem		

Match each word in column A to the related word in column B.

A		B
Apple juice		Input
Apple		Process
Squeeze		Output



A Hard Disk Drive

When a hard disk is manufactured, the platters are empty and so your computer can't read them. The process of creating the tracks and sectors on the platters and preparing the disk for use is called formatting. There are two types of formatting: low-level formatting and high-level formatting.

The process of low-level formatting a drive creates the tracks and sectors on the platter. Low-level formatting writes the start and end points of each sector onto the platters. This process prepares the drive to hold blocks of bytes. High-level formatting writes special file storage structures, onto the sectors. This process prepares the drive to hold files.

There are two ways to measure the performance of a hard disk:

- ❑ **Data rate** - The data rate is the number of bytes per second that the drive can send to the CPU. The data rate is usually between 5 and 40 megabytes per second.
- ❑ **Seek time** - The seek time is the amount of time between when the CPU requests a file and when the first byte of the file is sent to the CPU. The seek time is usually between 10 and 20 milliseconds.

### Floppy Disk

Floppy disks are also called diskettes. They are very slow compared to hard disks or CD-ROMs, and hold a smaller amount of data (1.44 megabytes).

Floppy disks are also quite fragile. Follow these rules to keep your data and floppy disks safe.

- ❑ Keep floppy disks away from magnets and magnetic fields.
- ❑ Don't take a diskette out of the drive while the drive light is on.
- ❑ Keep floppy disks away from very hot and cold places.
- ❑ Don't touch the surface of a floppy disk.
- ❑ Don't leave a floppy disk in the drive while you are not using it. Keep your disks in a closed box.



A Floppy Disk Drive



## CD-ROM

CD-ROM is short for Compact Disc-Read Only Memory. A CD-ROM disk can hold a very large amount of data (usually 650 - 700 megabytes). This is the same as the storage capacity of over 450 floppy disks.



A CD-ROM Drive

## DVD-ROM

DVD stands for Digital Video Disc, or Digital Versatile Disc. A DVD-ROM is like a CD-ROM, but it stores information in a different way so that it has a much bigger capacity than a CD-ROM (about 4.7 or 8.5 gigabytes of data on one side, or 17 gigabytes on a disk with two sides). Because DVD-ROMs can store so much data, they are often used to store movies and animation.

## Zip Disk

A Zip disk looks like a floppy disk, but it can hold a lot more data (up to 100 megabytes). Zip disks can only be read by a special drive called a Zip drive. Zip disk technology was invented by a company called Iomega.



## Magnetic Tape

Computers can read and write data on special cartridges of magnetic tape. A magnetic tape cartridge looks like a music cassette, but it can hold more data. Computer tape cartridges can only be read by a special tape drive. They are often used to make a safe copy of important data that a company or user doesn't want to lose.

Number the devices from 1 to 4 to show their capacity from the biggest to the smallest.

	Zip disk
	CD-ROM
	Floppy disk
1	Hard disk

ACTIVITY



1

Put a tick (✓) to show if the devices are portable or fixed.

DEVICE	PORTABLE	FIXED
Hard disk		✓
Floppy disk		
RAM		
Zip disk		
CD-ROM		

2

Match the words to compare computers and humans.

COMPUTERS	?	HUMANS
1. CPU		a. Eye
2. Speaker		b. Ear
3. Camera		c. Brain
4. Microphone		d. Mouth
5. Chassis		e. Clothes

3

Write the properties of each device in your computer.

MY COMPUTER	
DEVICE	PROPERTIES
Mainboard (type)	
Ports (number and type)	
CPU (type and speed)	
RAM (size in megabytes)	256 MB
Sound card (type)	

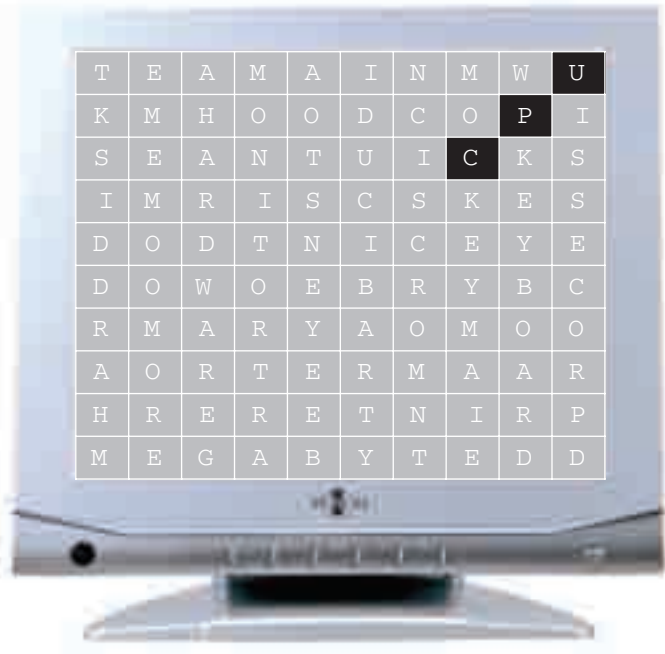
4

Take a price list from a computer seller company. Imagine your dream computer, then write the properties and the price of each device. What is the total cost of your dream computer?

Solve the clues and find each word in the wordsearch puzzle. The first one has been done for you.

- ~~Brain of the computer.~~
- Temporary storage device.
- Output device that gives you a copy of your work.
- 1048 Kbytes of information.
- Another name for motherboard.
- Physical parts of the computer.
- 8 bits of information.
- The most used output device.
- Input device for typing.
- The fastest permanent storage.

T	E	A	M	A	I	N	M	W	U
K	M	H	O	O	D	C	O	P	I
S	E	A	N	T	U	I	C	K	S
I	M	R	I	S	C	S	K	E	S
D	O	D	T	N	I	C	E	Y	E
D	O	W	O	E	B	R	Y	B	C
R	M	A	R	Y	A	O	M	O	O
A	O	R	T	E	R	M	A	A	R
H	R	E	R	E	T	N	I	R	P
M	E	G	A	B	Y	T	E	D	D







## CHAPTER

# 3

# Novell®

# X

Mac OS X



Types of Software

Operating Systems

Application Programs

Programming Languages

# SOFTWARE

## Types of Software



Computer software gives instructions that make hardware work. The three main types of software are operating systems (system software), application programs (application software), and programming languages (programming software).

An operating system controls the workings of the computer and applications. MS-DOS, Windows XP, and Linux are examples of operating systems.

An application program is a program designed to help with a specific task, such as word processing, accounting, counting the items in a shop or warehouse, or maintaining a database. Application software makes a computer work to suit your needs.

A programming language is used to make application programs. Basic, Pascal, Java, and Cobol are some examples of programming languages.

## Operating Systems

An operating system is a piece of software that controls how hardware resources such as memory, the central processing unit (CPU), disk space, and other devices are used. Applications need the operating system because they need to use these hardware resources.

An operating system has two parts, a kernel, and a shell. The kernel is the core of an operating system. It manages memory, files, and other devices, maintains the time and date, starts applications, and manages system resources. The shell provides direct communication between the user and the kernel. It is an interface between the user and the kernel.

There are many different types of operating system. We can classify systems according to the type of user interface, how many users they support (single-user or multi-user), how they perform tasks (single task or multitask), and how they work with other computers (single computer or network).

The user interface is the part of the operating system that you use to enter commands and data. There are two types of user interface, graphical user interface (GUI) and command-line interface (CLI).

A graphical user interface is a visual computer environment that represents programs, files, and options with images such as icons, menus, and dialog boxes on the screen. You can select and activate these options by pointing and clicking with a mouse, or by using the keyboard.

A command-line interface does not use images or graphical menus. Instead, you type commands with the keyboard, using a special command language. Systems with command-line interfaces often seem more difficult to learn and use than systems with graphical interfaces.

A single-user operating system can be used only by a single user. A multi-user operating system can be used by more than one user. In some ways, a computer that several people share is like a multi-user system. However, a real multi-user system means a machine (and operating system)

that several people can access at the same time, through communication facilities or network terminals.

A network operating system is an operating system which is specifically designed to support computer networks. A computer network is a set of computers that can communicate with each other and share sources. A network operating system uses a special machine called a server to provide networking support for multiple simultaneous users as well as administrative, security, and management functions. Unlike a single-user operating system, a network operating system must respond to requests from many computers, managing things such as network access and communications, resource use and sharing, data protection, and error control.

Single-task operating systems can work only on a single task at a time. Multitask operating systems can work on multiple tasks at the same time. Multitasking systems can be either cooperative or pre-emptive. In a cooperative multitasking system, the operating system waits for one task to voluntarily give control to another task. In a pre-emptive multitasking system, the operating system decides which task receives priority.

## **MS-DOS**

MS-DOS is short for Microsoft Disk Operating System. MS-DOS is single-task, single-user operating system with a command-line interface, which was released in 1981 for IBM PCs and similar PCs (called IBM compatible PCs). MS-DOS, like other operating systems, controls operations such as disk input and output, video support, keyboard control, and many internal functions related to running programs and maintaining files. MS-DOS is still available on PCs that use Microsoft software, although today many people prefer to use the Microsoft Windows operating system.

## **PC-DOS**

PC-DOS is short for Personal Computer Disk Operating System. PC-DOS is the version of MS-DOS sold by IBM. MS-DOS and PC-DOS are almost the same, although the file names of some utility programs are different.

## **Microsoft Windows 9x and Windows Me**

Microsoft Windows was one of the first graphical operating systems for home and office PCs. In the beginning, the early versions of Windows (now called Windows 3.x) were just a graphical interface to MS-DOS. In 1995, Microsoft completely redesigned the Windows operating system so that it was more advanced and faster, and ran almost independently of MS-DOS. The important releases of this new family of Windows systems are Windows 95 and Windows 98 (together called Windows 9x), and Windows Me.

**Windows 95** is an operating system with a graphical user interface for intel 80386 and higher processors. It was released by Microsoft Corporation in 1995. Windows 95 is a complete operating system, instead of a graphical interface that requires MS-DOS. It was designed to replace the old Windows



3.x systems and MS-DOS, although it can still run MS-DOS software. Under Windows 95, filenames can be up to 255 characters long and can include dots and spaces. Windows 95 supports a special technology called Plug and Play, that makes it easier to install and configure hardware. Windows 95 can also access networks that use the Windows, Novell NetWare, and Unix operating systems. The minimum configuration for Windows 95 is Intel 80386 processor with 4 MB of RAM, but an Intel 80486 or higher processor with at least 8 MB of RAM is recommended. Internet functionality in Windows 95 is provided by Microsoft Internet Explorer.

**Windows 98** is an operating system with a graphical user interface for i486 and higher processors. It was released by Microsoft Corporation in 1998. Windows 98 improved Windows 95 by making the interface better and making the system more reliable. Windows 98 integrates Internet connectivity more closely through an interface called Active Desktop, which includes Internet Explorer and allows users to access files on other computers in a user-friendly way. Windows 98 supports AGP ports, television tuner cards, DVD-ROM drives, multiple modems, and multiple monitors.

**Windows Me (Millenium Edition)** is another graphical operating system from Microsoft, which was released in September 2000. Windows Me was developed specifically for home users. Microsoft claims that Windows Me combines a more user-friendly interface for new users with added functionality for experienced users.

Windows Me works with the same applications and hardware as Windows 98. However, it improves Windows 98 by providing functions to reduce and correct errors in the system or hardware problems (what Microsoft is calling 'PC health'). It also has improved features designed for digital media, home networking, and the internet.



### **Mac OS**

Mac OS is short for Macintosh Operating System. It is the commercial name of the Apple Macintosh operating system, which began with version 7.5 in September 1994, when Apple started licensing software to other computer manufacturers.

Macintosh is a popular series of personal computers introduced by Apple in 1984. The Macintosh was one of the earliest personal computers to incorporate a graphical user interface, and the first computer to use 3.5-inch floppy disks. It was also the first computer to use the 32-bit Motorola 68000 microprocessor. Although the Macintosh was very user-friendly, it sold less than normal PCs during the 1990s. However, it is still often used for desktop publishing and graphics-related applications. In 1998, both Apple and Macintosh received a lot of publicity with the release of the iMac home computer.

The Macintosh operating system has had different names: Finder, System 6, System 7, System 9, Mac OS, and Mac OS X.





## OS/2

OS/2 is short for Operating System 2. It is a multitasking operating system for personal computers which use on the Intel 80286, 80386, 80486, and Pentium processors. It was developed by Microsoft and IBM, but today it is an IBM product. OS/2 can run most DOS applications and can read all MS-DOS disks. The OS/2 graphical user interface is called Presentation Manager. The latest version of OS/2, which is called OS/2 Warp 4, provides networking, Internet, and Java support, as well as speech recognition technology.

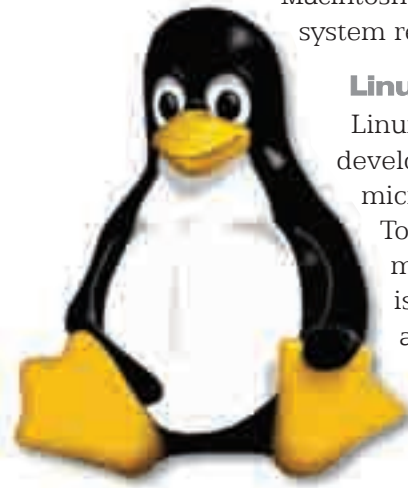
## UNIX

Unix is a multi-user, multitasking operating system. It was originally developed by Ken Thompson and Dennis Ritchie at AT&T Bell Laboratories between 1969 and 1973 for use on minicomputers. Unix has evolved into a complex, powerful operating system that is more portable and less machine-specific than many other operating systems. Unix uses a powerful command-line interface, although there are also graphical user interfaces for the Unix system.

There are many different versions of Unix, including System V (developed by AT&T for commercial release), BSD Unix (a free version of Unix which was developed at the University of California Berkeley), AIX (a version of System V which was adapted by IBM), A/UX (a graphical version of Unix for the Macintosh), Linux (a newer of Unix version that runs easily on home computers), and SunOS (based on BSD Unix and available on Sun workstations). Many versions of Unix are available for free. For some versions, the program code is also free, which means that software developers can help to improve and adapt the system. Unix is often used as a network operating system, especially for networks that use the Internet.

## Novell NetWare

Novell Netware is a family of LAN (local area network) operating system products developed by Novell, Inc. Novell NetWare runs on PCs and Apple Macintosh computers, and allows users to share files and system resources such as hard disks and printers.



## Linux

Linux is a version of Unix System V which was developed for PCs with Intel 80386 and higher-level microprocessors. Linux was first developed by Linus Torvalds, who gave the system its name, as well as many other software developers worldwide. Linux is free and its program code can be changed by anyone who chooses to work on it, although some companies distribute it as part of a commercial package with Linux-compatible utilities.



The Linux Operating System

The Linux kernel works with a set of free Unix system utilities. Like Unix, Linux has a powerful command-line interface with some graphical user interface support. Linux is used as an operating system for network servers and has recently started to receive support from major companies such as IBM and Compaq.

### **Windows NT**

The Windows NT operating system, sometimes just called NT, was released by Microsoft corporation in 1993. It is a completely self-contained operating system with a built-in graphical user interface. Windows NT is a pre-emptive multitasking operating system that has powerful networking, processing, and security features. It was designed specifically for office and business PCs and networks. Windows NT can run on a variety of hardware platforms including platforms based on the Intel 80386, i486, Pentium, and MIPS microprocessors. It can also run on multiprocessor computers.

### **Windows 2000**

Windows 2000 is a set of desktop operating systems and network servers which was announced by Microsoft in 1998. It was designed to replace Windows NT. Windows 2000 is built upon the NT kernel and uses an interface that is similar to the interface in Windows NT and Windows 9x. The Windows 2000 product line includes Windows 2000 Professional, Windows 2000 Server, Windows 2000 Advanced Server, and Windows 2000 Datacenter Server.

### **Windows XP**

Windows XP is the latest version of the Windows PC operating system. Some people say that Windows XP is the most important version of Windows since Windows 95. Windows XP is built on the Windows 2000 kernel but has



a new, more personalized graphical interface that makes it even easier to work with graphics and the Internet, and transfer files to other devices. Windows XP also allows different people to use their own system settings and files on the same computer.

Windows XP is an important Windows release because it is designed for both home PCs and office machines. In the past, Microsoft developed Windows 9x and Windows Me for home PCs, and Windows NT and Windows 2000 for offices. Windows XP combines these systems in two





versions, Windows XP Home version and Windows XP Professional version. The only difference between these versions is that the Professional version incorporates some features for the business world such as better support for uses that use more than one machine, and better security.

### BeOS

The BeOs graphical operating system was developed by Be, Inc. It was designed as a 'media OS,' that could support the large file sizes and high-performance processing demands of digital media and the Internet. BeOs can run on systems with two or more processors. Like many other operating systems, BeOS support pre-emptive multitasking, virtual memory, and memory protection. It also provides high-performance input/output capabilities, a file system that can support terabyte-sized files, and Internet features such as built-in e-mail and web services.



### Application Programs

#### Word Processor

A word processor is an application program for creating and manipulating text documents. A word processor is like an electronic paper, pen, typewriter, eraser, and, even a dictionary. Advances and developments in word processing applications mean that you can now see a document on screen that is the same as the same as the document that will be printed, with any colors, graphics, and text styles. All word processors allow you to change text styles (called fonts), page size, and text spacing, etc. Some word processors can also check spelling, find synonyms,

ACTIVITY

Put a tick (✓) to show if the operating systems have a graphical or command-line interface. Sometimes a system has both.

OPERATING SYSTEM	GRAPHICAL USER INTERFACE	COMMAND LINE INTERFACE
MS-DOS		✓
WINDOWS 9X		
WINDOWS NT		
WINDOWS 2000		
WINDOWS XP		
UNIX		
LINUX		
MAC OSx		
BEOS		
PC-DOS		
OS/2		



incorporate graphics created with another program, write math formulas, create and print letters, perform calculations, display documents in different ways, and allow you to record special programs (called macros) that perform complicated operations automatically.

Some popular word processors are Microsoft Word, Corel WordPerfect, StarWriter, Windows WordPad, MacWrite, and WordStar.

Put ticks (✓) in the columns to compare a typewriter with a word processor.

ACTION	TYPEWRITER	WORD PROCESSOR
You can correct your mistakes.		✓
You can work without electricity.		
You can save and reuse your work.		
You can make a few copies.		
You can make many copies.		
You can modify your work.		
You can add pictures.		
You can choose the font type and font size.		
You can use any color.		
After you finish typing, you can change the paper size.		
You can make the font italic, bold or underlined.		
You can draw.		
You can make charts.		
You can check your spelling and find synonyms.		

ACTIVITY

### Spreadsheet

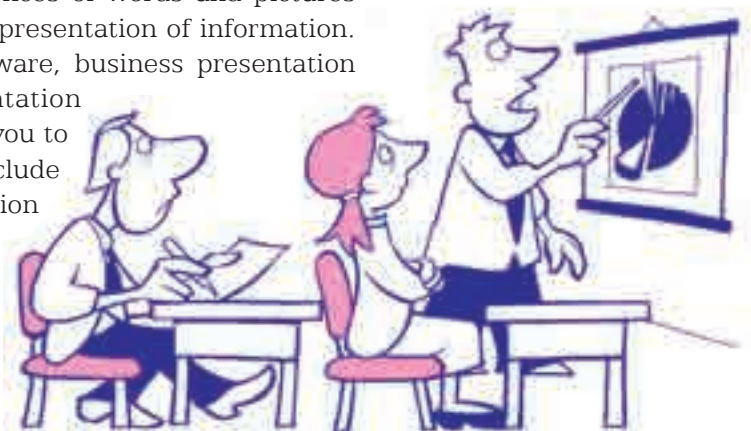
A spreadsheet application helps you to organize text and numeric data and perform calculations. Spreadsheet programs organize data in cells, like the cells in a table. Some cells contain formulas, such as the sum of all the numbers in one column of cells. If you change a number in the column, the value of the sum changes automatically. Spreadsheet programs usually also allow you to make and design graphs of data, and change the style (format) of text and numbers. Spreadsheet programs are very useful in offices for accounting, and for making financial plans and reports.

Some popular spreadsheet programs are Microsoft Excel, Lotus 1-2-3, StarCalc, and Corel Quattro Pro.

## Presentation Software

Presentation software applications (sometimes called 'presentation graphics applications') help you to create sequences of words and pictures that tell a story, or support a speech or a public presentation of information. There are two main types of presentation software, business presentation software, and general multimedia presentation software. Multimedia authoring software allows you to create more sophisticated presentations that include audio and video sequences. Business presentation software allows you to create simpler presentations, which can include images and sometimes audio and video developed with other tools.

Some popular presentation software applications are Microsoft PowerPoint, Lotus Freelance Graphics, Adobe Persuasion, Astound Presentation, Asymetrix Compel, Corel Presentations, and Harvard Graphics.



## Database

A database is a set of collections of data, for example, a set of information about the students in a class, with their name, age, and grades. A database program allows you to manage a database. It has four main parts: tables where the data is kept, forms that you use to enter data into the database, a way to search (query) the data, and a way to make reports that show the contents of the database.



Some popular database programs are dBase, Paradox, Microsoft Access, FoxPro, Oracle, SQL Server, InterBase, and Sybase.

## CAD/CAM

CAD/CAM is short for computer-aided design/computer-aided manufacturing. CAD/CAM applications help people to design and manufacture products using computer-generated models. CAD/CAM is useful for engineers, scientists, and architects, who can develop models of tools, molecules, aircraft, integrated circuits, robots, or even buildings using a computer. CAD/CAM applications create objects in two or three dimensions, and show the results either as wire-frame 'skeletons', as models with shaded surfaces, or as solid

Prepare a presentation and present it to your friends.

ACTIVITY

objects. Some programs can also rotate or resize models, show interior views, generate lists of the materials needed for construction, and perform other related tasks. CAD/CAM programs use a lot of math, so they often need the computing power of a high-performance workstation. The finished design is translated into a set of instructions that can be used by machines for manufacture, assembly, and process control.

Some popular CAD/CAM programs are AutoCAD, Orcid, and Electronic WorkBench.



### **Painting**

A paint program is an application program that creates graphics as a set of dots called a bit map. Paint programs are particularly useful for freehand drawing, for example, drawing using a mouse or light pen. Paint programs usually include tools to create lines, curves, and geometric shapes, which become part of the whole graphic.

Some common paint programs are Windows Paint, Corel Painter, and Adobe Photoshop.

### **Drawing**

A drawing program allows you to create 'object oriented' graphics instead of bitmaps. In an object-oriented graphic, you can move a part of the graphic, such as a line, a circle, or a block of text, as an independent object simply by selecting the object and moving it. Object-oriented graphics are created by combinations of lines, curves, circles, and squares.

Some popular drawing programs are CorelDRAW, and Macromedia FreeHand.

### **Page Layout and Publishing**

Many people use computers to create text and graphics documents for printing on a laser printer or a typesetting machine. This is called desktop publishing. The desktop publishing process involves different types of software and equipment. The original text and illustrations are usually produced with software such as word processors and drawing and painting programs, and with scanners. After this, the text and images are transferred to a page layout application. A page layout application allows you to organize text and graphics on the screen and see what the results will be. Page layout applications usually include word processing and graphics utilities so that you can make any necessary changes to the document. Finally, the finished document is printed

either on a laser printer or, for the best quality, by typesetting equipment.

Some popular page layout applications are Quark XPress, Adobe InDesign, and Microsoft Publisher.

## The Internet

The Internet is a worldwide network that connects thousands of commercial, government, educational, and other computer networks, and allows users to share data and messages. No single computer controls the Internet which means that the Internet is very powerful. Even if part of the Internet network stops working, computers can use other parts of the Internet to send their information.

Some popular types of Internet application are browsers used to see web pages (Internet Explorer, Netscape, Opera, and Mozilla) chat programs (ICQ, mIRC, MSN Messenger, and Yahoo! Messenger), web design programs (Microsoft FrontPage, Macromedia Dreamweaver), file transfer programs (Cute-FTP), e-mail programs (Microsoft Outlook Express, and Eudora), and download programs (GetRight, FlashGet, Go!zilla, and Download Accelerator).



## Multimedia

Multimedia is the combination of sound, graphics, animation, and video. Multimedia applications allow you to play multimedia files, such as music and movies, on your computer. Multimedia applications usually require a CD-ROM drive and writer, a sound card, a speaker, microphone. Multimedia files, are very large, so they are usually recorded on CD-ROMs.

Some popular multimedia programs are Microsoft Media Player, WinAmp, WinDVD, and ACDSee.



## Utilities

A utility program is designed to perform maintenance work on your computer or on computer components, or to help you with common tasks.

For example, there are utility programs to help you copy files and data to safe storage (called backing up data), retrieve (recover) lost or damaged data, make files smaller (called compressing files), and show and change the settings for your computer's resources.



Some popular utility programs are Norton Utilities, PC Tools, Norton Commander, Windows Commander, Partition Magic, Norton Ghost, Stacker, DriveSpace, WinZip, WinRar, PkZip, WinAce, Arj, and Adobe Acrobat Reader.

## Antivirus Software

A virus is a program that infects computer files by copying itself into files as they are loaded into memory. Viruses can spread very fast through a whole computer, or through diskette and Internet files that people copy from one machine to another. Viruses often damage computers. For example, some viruses can destroy a computer's hard disk, or take up memory space that could be used by other programs.

Some well-known viruses are Dark Avenger, Jerusalem, Crazy Boot, Soned, Yale, Cascade, One Half, Yankee, Brain, Disk Killer, Melissa, Nimda, Chernobil, and ILoveYou.

An antivirus program searches (scans) your computer's memory and hard disks to identify, and destroy viruses. It also examines files for viruses as your computer receives them.

Some common antivirus programs are Scan & Clean, Norton AntiVirus, Toolkit, McAfee, RAV, Trend PC-cillin, Kaspersky, Panda, and F-Prot.



## Games

Games allow you to interact with your computer as a form of entertainment. There are hundreds of different types of computer game, from simple alphabet games for young children, to chess, treasure hunts, war games, and simulations of world events. You can play games with a keyboard or with a joystick or other device. Games are and are supplied on floppy disks, on CD-ROMs, on game cartridges, or even on the Internet.

Some popular and famous games are Chess Master, Age Of Empires, SimCity, Fifa 2002, and Quake.



### Programming Languages

**Programming** is the art and science of creating computer programs. Computer programs are written using a special language called a programming language that a computer or programming application can understand. The writing process is called coding, and the result is called program code. However, to write a program, you need to know more than just a programming language. Computer programmers need to know how to put instructions in a logical order (called an algorithm), and about different types of interface, hardware, and operating system. They need to be able to think logically, like a computer. Computer programs can be very large and complicated, so often programmers work on one small part of a bigger program. They write and test this small part (called a module) before they add it to the main code.

A **programming language** is any artificial language that can be used to write instructions for a computer. Usually programming languages need special programs, called compilers, that translate the instructions into special code that the CPU and the hardware can process. This translation process is called compilation. English and other natural languages are too complicated for computers to understand, although some subsets of English are used and understood by some advanced programming languages. There are two types of programming language, low-level languages and high-level languages.

A **low-level language** is a programming language that is written for a particular set of hardware and processor, or that uses few control instructions and data types. Each statement in a program written in a low-level language usually corresponds to one machine instruction. There is only one low-level language, called assembly

Write the names of the software on your computer.

SOFTWARE	NAME
Operating system	Windows XP
Word processor	
Spreadsheet	
Presentation software	
Database	
CAD/CAM	
Painting	
Drawing	
Page layout	
Internet	
Multimedia	
Utilities	
Antivirus	
Games	

Ask ten people about the programs they use. Find the most popular three programs in each category and write them in the table.

SOFTWARE	FIRST	SECOND	THIRD
Operating system			
Word processor			
Spreadsheet			
Software			
Database			
CAD/CAM			
Painting			
Drawing			
Page layout			
Internet browser			
Utilities			
Antivirus			
Games			

language.

A **high-level language** is a computer language that is more abstract than machine language. Statements in a high-level language usually use words similar to English, and correspond to more than one machine language instruction. In practice, every computer language above assembly language is a high-level language. Some common high-level languages are Basic, Pascal, Java, Cobol, and Paradox.

A programming language can be a general-purpose language or a special-purpose language. General-purpose programming languages, such as Ada, Basic, C, or Pascal, are designed for a variety of applications and uses. Special-purpose languages are designed for a specific type of need or application. For example, SQL is a special-purpose language which is designed to be used only with databases.

Visual programming is a method of programming using a visual (graphical) programming environment. In visual programming, programmers choose basic program components with menu choices, buttons, icons, and special tools.

The following assembly program displays 'Hello World'.

```
push    dword len
push    dword msg
push    dword 1
move    eax, 0x4
call    _syscall
add     esp, 12
push    dword 0
move    eax, 0x1
call    _syscall
_syscall:
int     0x80
ret
msg db   "Hello World", 0xa
len equ  $-msg
```

### Assembly

Assembly language is a low-level programming language that uses abbreviations and codes to represent machine instructions. Each statement corresponds to a single machine instruction. An assembly language is translated to machine language by a program called an assembler and is specific to a particular processor. Although assembly language is difficult to learn, assembly programs run faster and allow programmers to control hardware directly.

### Basic

Basic is an acronym for Beginner's All-purpose Symbolic Instruction Code. It is a high-level programming language which was developed in the mid-1960s by John Kemeny and Thomas Kurtz at Dartmouth College. Many people think that Basic is one of the easiest programming languages to learn because instructions in Basic are easy to read, and similar to English.

The following Basic program displays 'Hello World'.

```
PRINT "Hello World"
```

## Fortran

Fortran is an acronym for 'formula translation'. Fortran was the first high-level computer language. It was developed between 1954 and 1958 by John Backus, an engineer at IBM. Fortran introduced important high-level programming concepts such as variables, expressions, statements, and formatted input/output. Fortran was originally used in science and engineering, but it has expanded and developed over time to become a useful language for many different purposes.

The following Fortran program displays 'Hello World'.

```
PROGRAM HelloWorld
    PRINT *, "Hello World"
END PROGRAM HelloWorld
```

## Pascal

Pascal was developed between 1967 and 1971 by Niklaus Wirth. It was originally created to help people learn to program a computer.

Pascal is a good general-purpose programming language that used to be

The following Pascal program displays 'Hello World'.

```
PROGRAM HelloWorld;
BEGIN
    WRITELN('Hello World');
END.
```

popular, although now programmers usually prefer C or C++.

## C

The C programming language was developed by Dennis Ritchie at Bell Laboratories in 1972. It is called C because evolved from an earlier language called B. Although many people think that C is more like an assembly language instead of a high-level language, it has become very popular in office programming. This is mostly because it is closely associated to Unix, a popular industry operating system, and because it was standardized by the American National Standards Institute (ANSI). C is a compiled language that contains a small set of functions that are machine-specific. The rest of the C functions are common to all machines and can be accessed from all C programs. C programs are composed of one or more functions defined by the programmer, which means that instead of running from beginning to end, a program jumps to different functions. For this reason, C is called a structured programming language.

The following C program displays 'Hello World'.

```
#include <stdio.h>
main() {
    printf("Hello World\n");
}
```

The following C++ program displays 'Hello World'.

```
#include <iostream.h>
void main()
{
    cout << "Hello World" << endl;
}
```

## C++

C++ is an object-oriented programming language 'object-oriented programming' means that the different parts of a program are like objects that can be created, destroyed, or changed, and that can interact with each other. Object-oriented programming is very powerful because objects can be shared and used again

in different applications. Non object-oriented programming is like building a car from the very beginning, from metal and bolts. Object-oriented programming is like using existing parts, such as an engine, the wheels, the body, etc. to build the car.

C++ was developed as an object-oriented version of C by Bjarne Stroustrup in the early 1980s at Bell Laboratories. It is supported by computer companies such as Apple and Sun Microsystems, Inc.

## Java

Java is a high-level language that was developed by Sun Microsystems. It is an object-oriented language like C++, but it is simpler than C++, so that many common errors can be avoided. Java code is compiled into code that can

The following Java program displays 'Hello World'.

```
import java.applet.*;
import java.awt.*;
public class HelloWorld extends Applet {
    public void paint(Graphics g) {
        g.drawString("Hello World",10,10);
    }
}
```

be run by a special program called a Java interpreter. Since Java interpreters, called Virtual Machines, exist in most operating systems, Java code can be run on computers with different operating systems.

Java is popular for many general purpose applications, although it is especially suitable for Internet applications.

## ASP (Active Server Pages)

ASP is a special technology developed by Microsoft that allows programmers to add special features to web pages. Active Server Pages are like normal web pages, but they include special commands (called script commands). When an Internet user asks a server machine for an Active Server Page, the server machine carries out the script commands and sends the result to the user. Because the command processing is done on the server machine, web programmers can write programs without worrying about which operating system or hardware and software an Internet user is running on their own machine. Active Server Page filenames end in .asp. ASP is becoming quite common on the Internet.



## COBOL

COBOL is an acronym for Common Business-Oriented Language. COBOL was developed between 1959 and 1961 and is still used today in business applications on mainframe computers. Program instructions in COBOL look a bit like English sentences, which means that COBOL is quite easy to understand. A COBOL program consists of an Identification Division, which specifies the name of the program and contains any other documentation the programmer wants to add; an Environment Division, which specifies the computer(s) being used and the files used in the program for input and output; a Data Division, which describes the format of the data structures used in the program; and a Procedure Division, which contains the procedures that the program uses.

## Visual Basic

Visual Basic is a high-level, visual programming version of Basic. It was designed by Microsoft Corporation for building Windows-based applications.

## Delphi

Delphi is a graphical version of Pascal, and was developed by Borland Inc. Delphi was especially designed for building Windows-based applications.

## Visual C++

Visual C++ is a high-level, visual programming version of C++. It was developed by Microsoft Corporation.

Put a tick (✓) in the right column for each piece of software.

SOFTWARE	OPERATING SYSTEM	APPLICATION SOFTWARE	PROGRAMMING LANGUAGE
MS-DOS	✓		
Microsoft Word			
Microsoft Windows			
Unix			
ACDSee			
Microsoft Excel			
Adobe Acrobat Reader			
Corel WordPerfect			
Windows Paint			
Winzip			
Norton AntiVirus			
Norton Commander			
Borland Delphi			
CorelDRAW			
C++			
WinAmp			
Adobe Photoshop			
Internet Explorer			
AutoCAD			
Microsoft FoxPro			

Discuss with your friends the necessity of copyright for computer software and write down the conclusions.

What kind of software do you use for each task? Write examples to complete the table.

TASK	SOFTWARE TYPE	NAME
Writing a letter	Word processor	Microsoft Word, Corel WordPerfect
Drawing a picture		
Copying files		
Listening to music		
Calculating the average of your marks		
Preparing an address book		
Sending an e-mail		
Playing a game		
Surfing the Internet		
Finding and destroying viruses		
Preparing a newspaper		
Writing a chess game		
Watching a movie		
Compressing a file		

Find the names of 19 programs in the wordsearch. Write them in the table with their type. The first one has been done for you.

L	A	O	U	T	L	O	O	K	L	H	A	P
M	E	E	R	I	A	T	I	L	O	S	L	O
L	T	C	E	F	R	E	P	D	R	O	W	W
A	L	I	S	M	J	D	Z	R	P	A	M	E
N	P	M	A	N	I	W	E	B	X	L	T	R
I	D	E	B	L	A	T	A	E	O	I	N	P
L	A	X	D	R	I	S	L	H	F	N	I	O
L	C	C	S	R	C	O	U	M	U	U	A	I
I	O	E	W	I	N	D	O	W	S	X	P	N
C	T	L	O	T	U	S	1	2	3	I	H	T
C	U	A	R	A	H	M	K	I	L	N	R	U
P	A	N	D	A	A	U	M	E	K	U	U	Q
S	C	O	R	E	L	D	R	A	W	A	I	L

	PROGRAM NAME	PROGRAM TYPE
1	Outlook	e-mail
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		

```

06/12/2002 18:24 40.9
08/23/2001 12:00 1.000.9
08/23/2001 12:00 66.0
08/23/2001 12:00 15.3
08/27/1996 02:12 93.5
09/26/1995 14:24 159.2
04/04/1996 02:11 2.063.8
04/04/1996 02:11 107.0
04/04/1996 02:11 93.1
04/04/1996 02:11 169.4
05/03/2000 17:23 7.5
08/26/1998 13:07 200.9
10/08/2000 15:51 65.5
08/08/2001 18:00 192.5
12/07/1999 12:00 5.3
06/29/2003 15:23 524.2
03/30/1995 09:17 26.9
08/03/2001 17:56 159.8
03/03/2003 09:24 33.7
03/03/2003 09:24 33.7
02/28/2003 18:26 46.3
06/29/2003 16:17 286.7
01/16/1997 00:00 71.6
04/08/1997 19:08 299.5
02/06/1998 21:39 304.1
04/11/2002 16:38 60.4
06/29/2003 16:14 107.9
06/29/2003 16:44 73.2
06/29/2003 16:44 253.9
43 File(s) 10.3
0 Dir(s) 799.4

```

```
C:\WINNT>ver
```

```
Microsoft Windows XP [Version 5.1
```

```
C:\WINNT>_
```

## CHAPTER

# 4

What is DOS?

How to Run DOS?

Basic Concepts

Internal and External  
Commands

Memory Usage

The DOS Boot Sequence

The AUTOEXEC.BAT and  
CONFIG.SYS Files

Getting Help

# MS-DOS

## What Is DOS?

DOS is short for 'Disk Operating System', in other words, a system that operates and controls the disks (such as hard disks, floppy disks, and CD-ROM disks) on your computer. In fact, DOS does more than just operate the disks: It also allows you to organize data files, load and execute (run) program files, and control the input and output devices attached to your computer.

DOS uses a command-line interface to receive instructions and display results. In

Microsoft Windows, users click on graphics and choose commands in a menu.

### Example of a DOS Screen

```
Microsoft Windows 2000 [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

D:\>dir
Volume in drive D has no label.
Volume Serial Number is 507F-48E2

Directory of D:\

11.09.2002  11:19                8 dir
11.09.2002  11:19                8 Documents
15.08.2002  17:13            <DIR>      Documents and Settings
11.09.2002  11:19                8 path
11.09.2002  11:19                8 Program
10.09.2002  10:13            <DIR>      Program Files
11.09.2002  11:19                8 ver
10.09.2002  11:29            <DIR>      WINNT
                    5 File(s)          8 bytes
                    3 Dir(s)      8,141,209,600 bytes free

D:\>ver
Microsoft Windows 2000 [Version 5.00.2195]

D:\>path
PATH=D:\WINNT\system32;D:\WINNT;D:\WINNT\System32\Win
D:\>
```



In DOS, you type commands with the keyboard. In some ways, DOS is less user-friendly than Windows, although learning DOS is a good way to understand how some parts of your computer work.

## How to Run DOS

DOS is the first main program that runs when your computer is switched on. When you switch your computer on, the computer loads DOS into RAM.

If you use Windows on your computer, Windows usually starts automatically after the main DOS commands have been processed. You can access DOS from Windows by choosing the MS-DOS Command

Prompt from the Start>Programs>Accessories menu.

## Basic Concepts

**Program:** A program is a sequence of instructions that can be executed (processed) by a computer. Some DOS programs are called TSR programs, short for Terminate and Stay Resident programs. A TSR program stays in memory even when it is not running, so that it can be started quickly even if another task is running. TSR programs are used with operating systems that are not multitasking, such as DOS.

**User:** A user is a person who uses computer programs.

**File:** A file is the basic unit of information storage on a computer. A file could be a program, a set of data used by a program, or a document that you create.

**Filename:** A filename is the name that you give to a file to distinguish it from all other files in a particular directory on a disk. Choose filenames carefully, as a good name will help you to remember what kind of information is in the file. A filename in DOS can contain up to eight characters, which can be numbers, letters, or certain symbols. For example, PDL, README, 4JULY96, and MEMO\_MAY are valid filenames. You cannot use the " / \ [ ] < > + = ; : , ? \* { } or space characters in a filename.

**Extension:** A file extension is a set of three characters that is added at the end of a filename, after a period (.). A file extension identifies the file type or family. It can be chosen by the user or by a program. For example, DOS uses .com or .exe for programs that DOS can load and run. An extension can contain the same letters, numbers and symbols that are allowed for file names.

**File attribute:** DOS uses file attributes to define special file types, for example, a hidden file (for a file that the user shouldn't see), a system file (for a file that is used by the operating system), or a read-only file (for a file that the user can't normally change). The file attribute is stored as part of the file.

**Disk:** A disk is any of the disks connected to your computer, for example, your hard disk, a CD-ROM, or a floppy disk.

**Disk drive:** A disk drive reads and copies information on a disk. There are three main types of disk drive: floppy disk drives, hard disk drives, and CD-ROM drives. Floppy disk drives are designed to accept removable disks. Hard disk drives are faster, high-capacity storage units that are completely enclosed in a protective case. CD-ROM drives are faster than floppy disk drives and slower than hard disk drives.

DOS operates different drives and transfers data (files or directories) between them. In DOS, every drive has a letter. The letter for the first hard disk drive is usually C. The letter for the floppy disk drive is A.

**Partition:** A partition is a section of a hard disk that functions like a separate disk. Usually, uses drive C for DOS a single partition disk. A and B are usually used for floppy disk drives. A two-partition hard drive usually contains C and D drives.

**FAT (File Allocation Table):** A FAT is a table or list maintained by some operating systems to manage the disk space which is used for file storage. When a file is stored on a disk, it is stored in separate pieces instead of one large block. The FAT keeps track of all these pieces.

**Current drive:** In DOS, you can move around between the different drives on your computer. The current drive is the drive where you are working.





**Directory:** A directory is a catalog for the files and other directories on a disk. A directory is a way of organizing and grouping files in a logical way. Directories are organized like the branches of a tree. One directory (branch) can have other directories (branches) below it.

**Root directory:** The top directory of a drive is called the root directory.

**Current directory:** In DOS, you can move around the different directories in your computer. The current directory is the directory where you are working. When you try to run a program in DOS, DOS searches the current directory first for the right program file.

**Subdirectory:** A subdirectory is a directory under (or below) the current directory in the tree structure.

**Parent directory:** A parent directory is the directory above the current directory in the tree structure.

**Path:** A path is the exact location of a file on your computer. The path name tells the computer where to find a file in the directory tree.

**Version:** A version is a particular issue or release of a hardware or software product. MS-DOS 1.0 was released as the first version of MS-DOS in August 1981. The latest version, MS-DOS 6.22, was released in April 1994.

**Command:** A command is an instruction to a computer program to perform a certain action. In DOS, you type commands using the keyboard.

**Command prompt:** The command prompt shows you where to enter DOS commands. The default DOS prompt is the current directory path followed by a greater-than sign (for example, C:\>).

To execute a command in DOS, type the command (for example, DIR) at the command prompt and press ENTER. You can type the command in either uppercase or lowercase letters. If you make a typing mistake, press the BACKSPACE key to erase the mistake, and then try again.

```
C:\>DIR
```

Displays a list of files and subdirectories in a directory.

**Parameter:** A parameter is a letter typed after a command, that tells the command to perform an extra task, or perform a task in a special way.

```
C:\>DIR /P
```

Displays a list of files and subdirectories in a directory, and pauses after each screenful of information.

**Wildcard:** A wildcard is a special character that you can use to represent one or many characters. DOS uses two wildcard characters, the asterisk (\*) and the question mark (?). The asterisk represents one or more characters, and the question mark (?) represents a single character. Wildcards are useful when you want to perform an operation on more than one file, or when you can't remember the exact name of a file.

**Cursor:** The cursor is the special on-screen marker (usually a flashing underline) that marks the place where the text that you type will appear.

**ASCII:** ASCII is an acronym for American Standard Code for Information Interchange. ASCII gives a special number (an ASCII code) to each different letter, numeral, punctuation mark and other symbol that a computer can understand. ASCII was developed in 1968 to standardize data transmission among different types of hardware and software. It is used by most minicomputers and all PCs. ASCII is divided into two sets: 128 characters (standard ASCII) and another 128 characters (extended ASCII).

**Driver:** A driver is a hardware device or a program that controls another device. A driver allows a computer to work with a particular device, such as a printer or a disk drive.

Internal and External Commands

There are two types of command in DOS, internal commands and external commands.

Internal commands are built into the operating system as part of a file called COMMAND.COM. Internal commands are loaded into memory whenever you switch on your computer. When you type an internal command, DOS performs it immediately. The table shows a list of internal DOS commands. Some commands (like MKDIR) have two forms. The second form is shown in brackets.

Files with a COM or EXE extension contain external commands. Because these commands are files, they are not built into the operating system and so the command names sometimes change between different versions of DOS. The table opposite shows a list of common external DOS commands.

When you type an external command, DOS looks for the command in the current directory. If it is not there, it looks for the command in the root directory. If it is not there, then you must guide DOS to the relevant directory with the PATH command.

DOS Internal Commands

BREAK	DEL (ERASE)	PAUSE	TYPE
CALL	DIR	PROMPT	VER
CHCP	ECHO	REM	VERIFY
CHDIR	EXIT	REN	VOL
CLS	GOTO	RMDIR (RD)	
COPY	IF	SET	
CTTY	MKDIR (MD)	SHIFT	
DATE	PATH	TIME	

DOS External Commands

APPEND	EDLIN	KEYB	SCANDSK
ASSIGN	EXE2BIN	KEYBXX	SETVER
ATTRIB	FASTOPEN	LABEL	SHARE
BACKUP	FC	MODE	SORT
CHKDSK	FDISK	MORE	SUBST
COMMAND	FIND	NLSFUNC	SYS
COMP	FORMAT	PRINT	TREE
DELTREE	GRAPTABL	RECOVER	XCOPY
DISKCOMP	GRAPHICS	REPLACE	
DISKCOPY	JOIN	RESTORE	

Working with Disks

PARTITIONING A DISK

A partition is a physical section of a disk such as a hard disk. A hard disk with two partitions works like two separate hard disks. This is useful if you want to run two different file systems.

Most personal computers today are sold with the drive already partitioned and loaded with the operating system. However, you can create your own disk partition with the DOS command FDISK. Before you run FDISK, make sure that your disk has been low-level formatted. An example of how to use FDISK is shown below.

EXAMPLE

A:\>FDISK

Type FDISK to start, then follow the steps.

NOTE

Be very careful when you use FDISK. If you make a mistake, you might damage your hard disk.

Suppose you have a hard disk that has 200 Mbytes capacity and you want to create two partitions: 100 MB and 100 MB.

STEP 1	A:\>FDISK
STEP 2	Choose '1' from the menu that appears and press ENTER.
STEP 3	Choose '1. Create Primary DOS Partition'.
STEP 4	Type 'N' and press ENTER.
STEP 5	Enter '100' for the partition size and press ENTER.
STEP 6	The primary partition is ready. Press ESC.
STEP 7	Choose '1. Create DOS Partition or Logical DOS Drive' and press ENTER.
STEP 8	Choose '2. Create Extended DOS Partition'.
STEP 9	The rest of the hard disk must be selected as 'Extended DOS Partition'. Press ENTER.
STEP 10	Press ESC.
STEP 11	All the Extended DOS Partition must be assigned as 'Logical DOS Drive'. Press ENTER.
STEP 12	Press ESC.
STEP 13	Choose '4. Display Partition Information'.
STEP 14	Press ESC.
STEP 15	Choose '2. Set Active Partition'. One of the partitions must be active to make the computer start from the hard disk.
STEP 16	Choose '1' to make C the active partition.
STEP 17	The active partition is ready. Press ESC.
STEP 18	Press ESC to exit FDISK.

PRACTICE

## FORMATTING A DISK

After a disk has been physically formatted and perhaps partitioned, it must also be logically formatted. Logical formatting puts a file system on the disk. A file system allows an operating system to use the available disk space to store and retrieve files. When you format a disk that contains data, the data is lost. Operating systems use different file systems, so the type of logical formatting that you use depends on the operating system you are going to use. DOS uses the FAT file system.

All file systems use structures such as files and directories, which are necessary for storing and managing data. A file system also performs three main functions:

- Managing the space on the disk.
- Maintaining directories and file names.
- Tracking where each file is physically stored on the disk.

Some of the most common file systems are:

FAT (File Allocation System),

FAT32 (File Allocation System 32),

NTFS (New Technology File System),

HPFS (High Performance File System),

Novell NetWare File System,

Linux Ext2, and Linux Swap.

### EXAMPLE

C:\>FORMAT A:	Formats your floppy disk.
C:\>FORMAT A: /s	Formats your floppy disk as a system disk. A system disk contains special files that you can use to start up (boot) your computer.
A:\>FORMAT C: /q	Performs a quick format of the hard disk.
A:\>FORMAT A: /u	Performs an unconditional format of your floppy disk, i.e., a format which ignores bad (damaged) sectors.

You have a floppy disk and you want to use it as a system disk.

### FIRST WAY

C:\>FORMAT A: /S

### SECOND WAY

(If the diskette is unformatted.)

C:\>FORMAT

C:\>SYS A:



### CHANGING THE CURRENT DRIVE

The first character of the command prompt shows the current drive usually A or C. If you start (boot) your computer from a floppy disk, the command prompt will start as A:\>. If you boot your computer from a hard disk, the prompt will be C:\>.

To change to a different drive, type the drive letter followed by a colon and press ENTER.

#### EXAMPLE

A:\> C:

Changes the current drive from A to C.

### NAMING A DISK

Use the LABEL command to create a name for a disk or diskette. This name is also called the volume label. You can also use the LABEL command to change or delete the current volume label. A volume label can be up to 11 characters long, and must not include spaces or TAB characters. Use the underscore(\_), or the minus sign(-), to create a break between words.

#### EXAMPLE

C:\>LABEL A: My\_Diskette

Gives the name My\_Diskette to the floppy disk in drive A.

C:\>LABEL C:

Deletes the label of the disk in drive C.

A:\>LABEL

Deletes the label of the disk in the current drive (drive A).

### COPYING A FLOPPY DISK

Use the DISKCOPY command to make a copy of the contents of a floppy disk onto another floppy disk.

- ☐ DISKCOPY only works if both diskettes are exactly the same type.
- ☐ The diskette you are copying from is called the source diskette. The diskette you are copying to is called the target diskette.
- ☐ You don't need to format the target diskette - DISKCOPY does it for you.
- ☐ DISKCOPY deletes any information you already had on the target diskette.

#### EXAMPLE

C:\>DISKCOPY A: B:

Copies the contents of the floppy disk in drive A to the floppy disk in drive B.

A:\>DISKCOPY A: A:

Copies the contents of the floppy disk in drive A to a different disk in drive A. DOS will ask you to insert the source disk and then the target disk.



DISPLAYING A DISK'S VOLUME LABEL	
EXAMPLE	Use the VOL command to display a disk's volume label and serial number, if they exist.
	D:\>VOL Displays the volume label and serial number of the disk in the current drive.
	A:\>VOL C: Displays the volume label and serial number of the disk in drive C (the hard disk).

COMPARING TWO FLOPPY DISKS	
EXAMPLE	Use the DISKCOMP command to check if two floppy disks are exact copies of each other. Both disks must have the same capacity, i.e. 720KB or 1.44MB.
	DISKCOMP is usually used immediately after the DISKCOPY command to make sure that both floppy disks are the same. DISKCOMP calls to the original disk the first disk, and calls the copy the second disk.
	C:\>DISKCOMP A: B: Compares the floppy disk in drive A with the floppy disk in drive B.
	A:\>DISKCOMP A: A: Compares two floppy disks in drive A. DOS will ask you to insert the disks one by one.

CHECKING THE CONDITION OF A DISK	
EXAMPLE	Use the CHKDSK command for the following operations:
	<input type="checkbox"/> Check a disk to see how much space there is available, and how much is in use. <input type="checkbox"/> Fix disk errors, such as showing wrong file size information. <input type="checkbox"/> Display information about the disk, including the total disk space, and the number and size of the files on the disk. <input type="checkbox"/> Display how much Random Access Memory (RAM) is available to DOS.
	Run CHKDSK occasionally on all your disks to check for errors.
	C:\>CHKDSK A: Checks the floppy disk in drive A for errors.
	C:\>CHKDSK A: /F Checks the floppy disk in drive A and fixes any errors.

## Working with Directories

### VIEWING THE CONTENTS OF A DIRECTORY

Use the DIR command to display a list of the files and subdirectories in a directory on the screen.

EXAMPLE	
C:\>DIR	Displays a list of the files and directories in the current directory.
C:\>DIR /P	Displays a list of the files and directories in the current directory one screen at a time.
C:\>DIR /W	Displays a list of the files and directories in the current directory in a wide list format.
C:\>DIR A:	Displays a list of the files and directories in the root directory of drive A.
C:\>DIR A:\WORKS	Displays a list of the files and directories in the directory A:\WORKS.
C:\>DIR *.EXE	Displays a list of all the files with the extension EXE in the current directory.
D:\>DIR A*.*	Displays a list of all the files with names beginning with the letter A in the current directory.
D:\>DIR ?.DOC	Displays a list of all the files in the current directory that have a one-letter filename with the extension DOC.
A:\>DIR *.*	Displays a list of all the files in the current directory.

### DISPLAYING THE STRUCTURE OF A DIRECTORY

Use the TREE command to graphically display the directory structure of a drive or path.

EXAMPLE	
C:\>TREE	Displays the tree structure of the current directory.
C:\>TREE A:	Displays the tree structure of drive A.
C:\>TREE D:\TEMP	Displays the tree structure of the D:\TEMP directory.

### CHANGING THE CURRENT DIRECTORY

Use the CHDIR or CD command to change from the current directory to a different directory.

EXAMPLE	
C:\>CD USERS	Goes to the USERS directory below the current directory.
C:\USERS>CD D:\TEMP	Goes to the D:\TEMP directory from the current directory.
C:\USERS\USR_1>CD..	Goes back to the parent directory (USERS).
C:\USERS\USR_1>CD\	Goes to the root directory.

### CREATING A NEW SUBDIRECTORY

Use the MKDIR or MD command to make a new subdirectory. Every disk drive has a root directory which can have subdirectories. The subdirectories can have subdirectories, and so on. Directory names can use the same characters and symbols as filenames. Directory names do not usually have an extension.

EXAMPLE	
C:\>MD USERS	Creates a new subdirectory called USERS below the current directory.
C:\>MD \USERS\USR_1	Creates a new subdirectory called USR_1 in the USERS subdirectory.

## DELETING A SUBDIRECTORY

Use the RMDIR or RD command to delete a subdirectory.

- ☐ You can only remove a subdirectory if it is empty (i.e., if it doesn't contain any files or subdirectories).
- ☐ You can only remove one subdirectory at a time.
- ☐ You cannot remove the root directory.
- ☐ You cannot remove the current directory. If you want to remove the current directory, first make sure that it is empty, then move to the parent directory and use the RMDIR or RD command to delete the directory.

### EXAMPLE

C:\>RD \USERS\USR_1	Deletes the directory USR_1 in the USERS subdirectory.
C:\>RD USERS	Deletes the USERS subdirectory.

## DELETING A DIRECTORY TREE

Use the DELTREE command to delete a directory with all its subdirectories and files.

### EXAMPLE

C:\>DELTREE USERS	Deletes the USERS directory and its contents.
-------------------	---

## COPYING A DIRECTORY TREE

Use the XCOPY command to copy all the files in a directory.

### EXAMPLE

A:\>XCOPY TEMP C:\USERS	Copies all the files from the TEMP directory to the C:\USERS directory.
D:\>XCOPY A:\TEMP C:\USERS	Copies all the files from the A:\TEMP directory to the C:\USERS directory.
C:\>XCOPY USERS D:\TEMP /S	Copies all the files and subdirectories from the USERS subdirectory into the D:\TEMP directory. The S parameter tells DOS to copy subdirectories as well as files.

Working with Files

CREATING A NEW FILE

Use the COPY CON command to create a text file and enter text.

EXAMPLE

```
C:\>COPY CON ADDRESS.TXT
87 GREEN STR
LONDON
^Z
```

Creates a text file that is called ADDRESS.TXT in the current directory.

To stop data entry press CTRL+Z, or F6.

DOS also provides a text editing program called EDIT. You can create, open, edit, and print text files using EDIT.

For example, type EDIT ADDRESS.TXT to create a file called ADDRESS.TXT and open it in the DOS editor.

DISPLAYING THE CONTENTS OF A FILE

Use the TYPE command to display the contents of a file on the screen. There are some files, for example, operating system commands or applications software, which you may not be able to read because they contain non-alphabetic and non-numeric characters.

EXAMPLE

```
C:\>TYPE AUTOEXEC.BAT
```

Displays the contents of the file AUTOEXEC.BAT which is in the current directory.

```
C:\>TYPE COMMAND.COM | MORE
```

Displays the contents of the file COMMAND.COM one screen at a time. Can you read it?

```
C:\>EDIT A:\AUTOEXEC.BAT
```

Opens the file A:\AUTOEXEC.BAT.

Create a batch file MYFILE.BAT in C:\ that performs the following operations. Test your new file by running it.

- a. Creates a new directory NEW in C:\.
- b. Copies the contents of the directory A:\WORK to C:\NEW.
- c. Deletes the directory A:\WORK.

## COPYING FILES

Use the COPY command to copy a file or a group of files in the current directory, from one disk or directory to another.

### EXAMPLE

C:\>COPY CONFIG.SYS A:\	Copies the file CONFIG.SYS to the root directory in drive A.
C:\>COPY CONFIG.SYS C:\TEMP	Copies the file CONFIG.SYS to the TEMP directory in drive C.
C:\>COPY CONFIG.SYS \TEMP	Copies the file CONFIG.SYS to the TEMP directory in drive C.
C:\>COPY CONFIG.SYS A:	Copies the file CONFIG.SYS to the last directory you came from in drive A.
A:\>COPY *.* C:\TEMP	Copies all the files in the current directory to the TEMP directory in drive C.
C:\TP\BIN>COPY *.EXE A:\	Copies all the executable files in the current directory to the root directory of A.
A:\>COPY PROG?.PAS C:\PROGS	Copies all the files whose names match the pattern to the PROGS directory in drive C. The '?' wildcard can be any character.
C:\>COPY OLD.TXT NEW.TXT	Creates a copy of the file OLD.TXT in the current directory and calls it NEW.TXT.
C:\>COPY OLD.TXT A:\NEW.TXT	Creates a copy of the file OLD.TXT in the current directory and copies it to the root directory in A with the name NEW.TXT.

Copy all the document files (.DOC and .TXT files) in C:\TEMP to D:\DOCS, and all the bitmap files (.BMP and .JPG files) in C:\TEMP to D:\PICTURES.

## COMBINING FILES

Use the COPY command to combine two or more files in a single file. Combining files like this is called merging the files.

### EXAMPLE

C:\>COPY LIST1.TXT+LIST2.TXT LISTS.TXT	Merges the files LIST1.TXT and LIST2.TXT in a new file, LISTS.TXT
C:\>COPY LIST1.TXT + LIST2.TXT	Merges the files LIST1.TXT and LIST2.TXT and puts the result in LIST1.TXT



## RENAMING FILES

Use the RENAME or REN command to change the name of a file. Be careful: you cannot have two files with the same name in the same directory.

### EXAMPLE

C:\>REN OLD.TXT NEW.TXT	Renames the file OLD.TXT to NEW.TXT.
C:\>REN *.HLP *.TXT	Changes all the extensions HLP to TXT in the current directory.

## DELETING FILES

Use the DEL or ERASE command to delete files that you no longer need. Deleting old files makes room for new ones. Be careful: once you delete a file, it's to get it back.

### EXAMPLE

C:\>DEL \TEMP\*.*	Deletes all the files in the TEMP directory.
A:\>DEL C:\BP\BIN\*.BAK	Deletes all the backup files (files with extension BAK) in the C:\BP\BIN.
A:\>DEL .	Deletes all the files in the current directory.

## MOVING FILES

Use the MOVE command to transfer files from one directory to another directory. The MOVE command is like COPY followed by DEL.

### EXAMPLE

C:\>MOVE CONFIG.SYS A:\	Moves the CONFIG.SYS file in the current directory to the root directory of A.
A:\>MOVE PROG?.PAS C:\PROGS\	Moves files from the root directory of A to the C:\PROGS directory C. This command only moves files with the extension PAS, whose filenames are five characters long and begin with PROG.
C:\>MOVE OLD.TXT NEW.TXT	Renames the file OLD.TXT in the current directory as NEW.TXT.
C:\>MOVE OLD.TXT A:\NEW.TXT	Moves the file OLD.TXT from the current directory to the root directory of A, and gives the new file the name NEW.TXT.

## UNDELETING DELETED FILES

Use the UNDELETE command to get back (recover) files that you have deleted by mistake. The DEL command doesn't actually delete files physically on the disk. It replaces the first character of the names of deleted files with a special character. Until a new file is written on the same disk area by DOS, you can recover a file that you have deleted.

### EXAMPLE

C:\>UNDELETE *.BAT	Restores any deleted files with the extension BAT in the current directory.
--------------------	---

## PRINTING A FILE

Use the PRINT command to send a file to a printer.

### EXAMPLE

**C:\DOCS>PRINT MEMO.TXT** Prints the contents of the file MEMO.TXT which is in the current directory.

## CHANGING FILE ATTRIBUTES

Use the ATTRIB command to display or change file attributes.

- + Sets an attribute.
- Clears (removes) an attribute.
- R Read-only file attribute.
- A Archive file attribute.
- S System file attribute.
- H Hidden file attribute.

### EXAMPLE

**C:\>ATTRIB +R AUTOEXEC.BAT**

Sets the read-only attribute of the file AUTOEXEC.BAT in the current directory.

**C:\>ATTRIB +H AUTOEXEC.BAT**

Sets the hidden attribute of the file AUTOEXEC.BAT in the current directory.

**C:\>ATTRIB -R -H AUTOEXEC.BAT**

Removes the read only and hidden attributes of the file AUTOEXEC.BAT in the current directory.

**A:\>ATTRIB +R +H +S \*.SYS**

Sets the attributes of all the files with the extension SYS in the current directory to read only, hidden, and system.

Practise working with file attributes.

- a. Set the hidden attribute of C:\AUTOEXEC.BAT.
- b. Display the contents of C:\. Can you see the file AUTOEXEC.BAT?
- c. Remove the hidden attribute of C:\AUTOEXEC.BAT.
- d. Display the contents of C:\. Can you see the file AUTOEXEC.BAT now?

## Some Additional Commands

### VER

Displays the version of DOS that you are using.

### DATE

Displays the current date and allows you to change it.

### TIME

Displays the current time and allows you to change it.

### CLS

Clears the screen.

Check the system date and time on your computer. If they are not correct, change them.

```
C:\>TIME
The current time is: 12:01:14.30
Enter the new time:

C:\>DATE
The current date is: Fri 08/08/2003
Enter the new date: <dd-mm-yy>

C:\>_
```

DOSKEY

Use the DOSKEY command to access a list of the commands that you have used. Use the UP and DOWN arrows to recall commands, ESC to clear the command line, F7 to show the command history, ALT+F7 to clear the command history, and F8 to search the command history.

PROMPT

Use the PROMPT command to change the command prompt. Write the new prompt using normal characters and the following special codes:

Change the command prompt to your name, a space, the current drive, and a greater-than sign. For example:  
JOHN C:\>

- \$Q = (equal sign)
- \$\$ \$ (dollar sign)
- \$T Current time
- \$D Current date
- \$P Current drive and path
- \$V MS-DOS version number
- \$N Current drive
- \$G > (greater-than sign)
- \$L < (less-than sign)
- \$B | (pipe)
- \$\_ ENTER-LINEFEED
- \$E ASCII Escape code (code 27)
- \$H Backspace (to delete a character that has been written in the command prompt)

EXAMPLE

C:\>PROMPT COMPUTER\$G	Changes the command prompt to COMPUTER>.
COMPUTER>PROMPT \$P\$G	Changes the command prompt to C:\>.

PATH

Use the PATH command to display or set a search path for executable files (i.e., files with extension EXE). When you type the name of an executable file that you want to run, DOS searches the executable files in the current directory. If the file you need doesn't exist in the current directory, DOS searches for it in the root directory. If the file you need is not in the root directory, then DOS searches each directory in your search path. The search path contains a list of directories and subdirectories. It is usually stored in a file called AUTOEXEC.BAT that the computer reads when you switch it on.

EXAMPLE

C:\>PATH	Displays the current search path.
C:\>PATH C:\TP\BIN	Changes the search path to C:\TP\BIN.

## Memory Usage

**Conventional Memory:** Conventional memory is the first 640 KB of memory.

**Extended Memory (XMS):** The original version of DOS was designed for the Intel 8086 micro processor and could only use the first 640 KB of memory. In 1984 IBM released the AT computer, which was based on the Intel 80286. On an AT computer, the first 640 KB of memory, i.e. conventional memory, was used by DOS, and the memory between 640 KB and 1 MB was used by the computer system itself. The rest of the memory, above 1 MB, is called Extended Memory. DOS could not use this Extended Memory, although other operating systems such as UNIX, or early versions of Windows or OS/2, could.

**Expanded Memory (EMS):** Three companies, Lotus, Intel and Microsoft worked together and produced a specification called Expanded Memory, especially for programs that needed more than 640 KB of memory. Windows applications do not require Expanded Memory.

**The Upper Memory Blocks and the High Memory Area:** Since the release of DOS 5, it is possible to load DOS Terminate and Stay Resident (TSR) programs and device drivers into the memory space between 640 KB and 1 MB. This area of memory is called the Upper Memory Blocks (UMBs).

The UMBs are divided into 6 areas (or blocks). Each block is 64 KB and they are called the A block, the B block, the C block, the D block, the E block, and the F block.

The ROM-BIOS is loaded into the F block. The A and B blocks are used by the video system (i.e. the video ROM).

The remaining blocks used may be ROM chips associated with hard disks or network cards (or any additional PC card that is installed into a PC that contains a RAM or ROM chip).

Since the release of DOS 5, it has been possible to use an extra 64 KB area, directly above the 1 MB area. This is called the High Memory Area (HMA). It is not possible to load device drivers or TSR programs into the HMA, but part of the DOS operating system (the two hidden files and COMMAND.COM) can be loaded here.

## The DOS Boot Sequence

When you switch on your computer, it starts (boots) using information on a disk. Usually a computer boots from the hard disk, but if there is a floppy disk in the floppy disk drive, your computer will try to boot from the floppy disk instead.

To boot properly, the computer needs to find a boot record (special boot information), the DOS system files (IO.SYS and MS-DOS.SYS), and the COMMAND.COM file that contains the internal DOS commands, on the boot disk. The DOS configuration files (i.e. CONFIG.SYS and AUTOEXEC.BAT) are desirable, but not necessary.

When you start your computer the boot steps are:

1. ROM-based diagnostics.
2. The computer finds the boot record and executes the commands it contains. If it doesn't find the boot record, the computer displays an error message.
3. The boot record searches for the two system files, and if it finds them, it loads the first one (IO.SYS). If IO.SYS is not present, then a message is displayed. IO.SYS contains the system device drivers, that allows DOS to communicate with the standard components of the PC.
4. The computer loads MS-DOS.SYS. This is the DOS Kernel.
5. The computer loads CONFIG.SYS, if it is present.
6. The computer loads COMMAND.COM. This is the DOS Command Interpreter.
7. Finally, the computer loads AUTOEXEC.BAT.

### The AUTOEXEC.BAT and CONFIG.SYS Files

When your computer boots it reads two very important files called CONFIG.SYS and AUTOEXEC.BAT. These files are usually in the root directory of the boot disk (which is usually the hard disk). These files contain important information about the system devices, and some important DOS settings.

#### AUTOEXEC.BAT file

AUTOEXEC.BAT is a batch file that contains commands that DOS runs when your computer starts. AUTOEXEC.BAT is generally used to customize your computer's settings to suit your environment.

Batch files contain a list of commands in a file. You can run all the commands by writing the name of the batch file at the command prompt and pressing Enter.

A batch file is useful if you have a set of DOS commands that you often need to run in the same order.

Display and  
examine the  
contents of  
AUTOEXEC.BAT  
on your  
computer.

#### This is an example of an AUTOEXEC.BAT file

```
@ECHO OFF
SET LMOUSE=C:\MOUSE
SET TEMP=C:\TEMP
PATH C:\;C:\DOS;C:\TC\BIN;C:\WINDOWS
LH KEYB UK,,C:\DOS\KEYBOARD.SYS
PROMPT DOS V6.22$p$g
LH /L:0;2,45488 /S C:\DOS\SMARTDRV.EXE /X 512 128
LH /L:0;2,25808 /S C:\MOUSE\MOUSE
CLS
VER
WIN
```

<b>@ECHO OFF</b>
Tells DOS to just read the lines in the file without displaying them on the screen.
<b>SET LMOUSE=C:\MOUSE</b>
Points to the directory which contains the mouse driver. This is only necessary if you have a specialized, non-standard mouse. It is not necessary if you have a standard mouse.
<b>SET TEMP=C:\TEMP</b>
Tells Windows and MS-DOS where to store temporary files.
<b>PATH C:\; C:\DOS; C:\TC\BIN; C:\WINDOWS</b>
Sets the directory path, i.e. the list of directories that MS-DOS will look in to find a program if it is not in the current directory. In this example, DOS will look first in the C:\ directory, then in the C:\DOS directory, then in the C:\TC\BIN directory, and finally in the C:\WINDOWS directory.
<b>LH KEYB UK,,C:\DOS\KEYBOARD.SYS</b>
Loads the KEYB program into the upper memory blocks with the setting UK (for a UK keyboard). This tells MS-DOS that your keyboard uses a UK keyboard layout.
<b>PROMPT DOS V6.22\$p\$g</b>
Sets the DOS command prompt. This example uses characters and special symbols to create the prompt DOS V6.22C:\>.
<b>LH /L:0;2,45488 /S C:\DOS\SMARTDRV.EXE /X 512 128</b>
Loads the MS-DOS disk cache command SMARTDRIVE into the upper memory blocks. The SMARTDRIVE program makes it possible to use a part of the hard disk as virtual memory.
<b>LH /L:0;2,25808 /S C:\MOUSE\MOUSE</b>
Loads the mouse driver used by DOS programs into high memory. If you never use a mouse with DOS, you do not need to load this driver.
<b>CLS</b>
Clears the screen, i.e. deletes any text on the screen.
<b>VER</b>
Displays the DOS version number on the screen.
<b>WIN</b>
Starts Windows. Without this line your computer will leave you at the C:\> prompt after it has booted.



**CONFIG.SYS file**

CONFIG.SYS the second important DOS configuration file. It is usually used to customize hardware devices.

This is an example of a CONFIG.SYS file	
DEVICE=C:\DOS\HIMEM.SYS	
DEVICE=C:\DOS\EMM386.EXE RAM	
DOS=HIGH,UMB	
BUFFERS=10,0	
FILES=40	
LASTDRIVE=E	
FCBS=4,0	
STACKS=9,256	
COUNTRY=044,,C:\DOS\COUNTRY.SYS	
DEVICEHIGH /L:2,15792 =C:\DOS\DISPLAY.SYS CON=(EGA,850,2)	

DEVICE=C:\DOS\HIMEM.SYS	
Allows DOS to access the high memory area, just above the 1MB area.	
DEVICE=C:\DOS\EMM386.EXE RAM	
Allows DOS to access the upper memory blocks between 640Kb and 1MB, and also to recognize the type of memory available above 1MB, In this example, the memory type is expanded memory and upper memory blocks.	
DOS=HIGH,UMB	
Moves most of the DOS file COMMAND.COM above the 1MB area into high memory.	
BUFFERS=10,0	BUFFERS sets an area of memory for commands that are waiting to be processed.
FILES=40	FILES sets the number of files that DOS can keep open at the same time.
LASTDRIVE=E	LASTDRIVE sets the last drive letter that DOS recognizes (usually E, although the maximum value is Z).
FCBS=4,0	FCBS sets information about file control blocks. File control blocks contain details of a file.
STACKS=9,256	STACKS sets internal areas of memory that DOS uses to make calculations and process operations.

<b>COUNTRY=044, ,C:\DOS\COUNTRY.SYS</b>
Tells DOS which country you are from. Each country except the USA has its own code number. The code number is usually the same as the international telephone code for the country. Here, the country is set to 44, i.e., which is the United Kingdom.
<b>DEVICEHIGH /L:2,15792 =C:\DOS\DISPLAY.SYS CON=(EGA,850,2)</b>
Tells DOS to load into an upper memory block the display system TSR program which is configured for your monitor's display. The DISPLAY command allows you to display international characters on your monitor.

Getting Help

You can get help about DOS commands in two ways.

1. Get information about all DOS commands.	
<b>EXAMPLE</b>	
C:\>HELP	Displays information about all commands.
2. Get information about only one DOS command.	
<b>EXAMPLE</b>	
C:\>HELP XCOPY	Displays information about the XCOPY command.

Find out how to add some lines in your AUTOEXEC.BAT file to display a menu when you switch on your computer, so that you can choose to start one of the programs in the menu. Your menu could look like this, for example.

Choose a program to start:

1. Norton Commander
2. Pascal
3. C
4. Windows
5. DOS

MS-DOS has been designed in English. Design an operating system in your own language.

Display and examine the contents of CONFIG.SYS on your computer.

SOME DOS ERROR AND WARNING MESSAGES	
MESSAGE	DESCRIPTION
Are you sure (Y/N)?	You are going to delete some data. Make sure that you want to delete it.
File not found <filename>	You wanted to find, copy or delete the file called <filename>, but DOS cannot find the file.
General Failure reading drive <drive name>	DOS cannot read from a drive. The file might have bad sectors. You should run Scandisk.
File cannot be copied onto itself	You tried to copy to a file with the same name in the same directory.
Not enough memory	You are running very large programs in memory and there is no more memory. Exit some programs to make space in the memory.
Bad or missing command interpreter	The COMMAND.COM file is missing or corrupted.
Not ready reading drive A: Abort, Retry, Fail?	The floppy disk is not properly inserted in the floppy disk drive.
Access Denied	You are trying to delete or make changes to read-only files.
Required parameter missing	You didn't enter enough parameters for a command.
Data error reading drive A:	The floppy disk is damaged. You should run Scandisk, or format the disk again.
Error in EXE file	An EXE file is broken or may be infected by a virus.
Insufficient disk space	There is not enough space on the drive.
Directory already exists	You tried to create a directory which already exists.
Non-system disk or disk error Replace and strike any key when ready	You tried to boot your computer from a disk which is not a system disk.
Unable to create directory	You tried to create a directory with an invalid name.
Write-protect error writing drive A:	Your floppy is write protected. Change the write protect switch on the floppy disk.
Bad command or file name	You entered a wrong command or executable filename.
Invalid drive specification	You entered a drive name that doesn't exist or that DOS can't see.
Invalid path	You entered a wrong path for a file.
Invalid switch /x	You used an wrong switch for a command.
<filename> Delete (Y/N)?	You are going to delete a file. Make sure that you want to delete it.
Press any key to continue Strike any key when ready ...Press ENTER when ready	The computer is waiting for you to do something. Press ENTER or any key to continue.
Track 0 bad, disk unusable	The first track on your disk is broken. Your disk is most probably unusable. Run Scandisk to try to repair the disk.
Warning: All data on non-removable disk Drive C: will be lost! Proceed with format (Y/N)?	You are going to lose all the data on the hard disk when you format it. Make sure that you want to format it.
Parameter format not correct	You entered a wrong parameter for a command.
Format another (Y/N)	Do you want to format another floppy disk?
Too many parameters	You entered too many parameters for a command.
Invalid directory	You wanted to use or copy to a directory which does not exist.

Solve the clues and find each word in the wordsearch puzzle. The first two have been done for you.

C	O	Y	R	O	T	C	E	R	I	D	B	U	S	N
B	I	R	T	T	A	T	Y	P	E	F	S	Y	S	H
G	D	E	L	T	R	E	E	R	A	N	I	T	E	U
F	O	R	M	A	T	T	K	L	E	B	A	L	L	A
R	S	E	T	A	D	I	S	K	C	O	P	Y	E	T
E	N	I	A	O	N	M	O	V	E	N	R	R	S	D
S	O	N	F	Y	R	E	D	O	U	T	O	O	R	N
U	C	O	U	N	D	E	L	E	T	E	S	T	H	A
N	Y	I	A	V	M	I	V	I	A	E	R	C	L	M
O	P	T	T	E	C	T	S	I	F	S	U	E	A	M
I	O	I	P	F	D	I	S	K	R	A	C	R	S	O
S	C	T	M	R	R	D	N	H	C	D	G	I	T	C
R	L	R	O	V	E	E	R	T	C	O	O	D	I	R
E	S	A	R	E	T	E	M	A	R	A	P	M	P	U
V	T	P	P	R	I	N	T	P	C	O	P	Y	E	R

CLUE	WORD
A sequence of instructions that can be executed by a computer.	PROGRAM
This command copies the contents of one floppy disk to another.	DISKCOPY
A letter typed after a command that tells the command to perform a task in a special way.	
This command recovers deleted files.	
It can contain up to eight characters.	
An alternative command for DEL.	
One or more symbols that show you where to enter commands.	
A catalog for filenames and other directories stored on a disk.	
Acronym for American Standard Code for Information Interchange.	
A child directory of another directory.	
This command creates or deletes partitions on a disk.	
This command displays or sets the system time.	
A logically distinct portion of a disk that is like a separate disk.	

CLUE	WORD
A particular issue or release of a hardware product or software title.	
This command clears the screen.	
This command creates a new file.	
A text editor in DOS.	
This command is another form of RENAME.	
This command prepares a disk for use with DOS.	
An instruction in a computer program.	
The top directory of a drive.	
This command is another form of DELETE.	
This command creates, changes, or deletes the name of a disk.	
A route through a structured collection of information.	
This command provides help information for DOS commands.	
This command displays previous DOS commands.	
This command displays the contents of a file.	
This command prints a file.	
This command copies one or more files to another location.	
This command displays the DOS version.	
This command displays a list of files and subdirectories in a directory.	
This command displays or changes file attributes.	
This command displays or sets the date.	
This command moves and renames files.	
This command graphically displays the structure of a drive or path.	
This command deletes the contents of a directory with all its subdirectories.	
This command creates a directory.	
This command changes the current directory.	
Acronym for Disk Operating System.	
This command deletes a directory.	
Acronym for File Allocation Table.	
A special on-screen indicator.	
A person who uses a computer.	
A complete, named collection of information, such as a program, a set of data used by a program, or a user-created document.	
A hardware device that reads from, or writes to, a disk.	

# REVIEW QUESTIONS & PRACTICES

1. What does an operating system do?
2. Give two examples of DOS commands.
3. What must be done first to a new floppy disk?
4. What is the most common size and capacity of a floppy disk?
5. How are hard disks better than floppy disks?
6. What is wrong with each filename?
  - a. RECIPE,DOC
  - b. ONE+ONE.TWO
  - c. COM1.EXE
7. Give the full pathname for the file MEMO.DOC which is in the DOCS directory in the root directory of the C drive.
8. COMMAND.COM is a command file.
  - a. What is the filename?
  - b. What is the extension?
9. What are the two types of DOS command?
10. What is an alternative command for DEL?
11. What do you need to set so that DOS can find a command that is not in the current directory?
12. What is a parameter? Give an example.
13. Which command do you use to check the condition of a disk?
14. How many characters do these wildcards represent?
  - a. ?
  - b. \*
15. The floppy disk that you copy from is called the \_\_\_\_\_ disk. The disk that you copy to is called the \_\_\_\_\_ disk.
16. Write the command to copy a floppy disk in drive A to another floppy disk if you only have one floppy disk drive.
17. Create a system diskette. (Format and transfer the system files to it.)
18. Check the condition of a floppy disk. How many hidden files are there?
19. Copy the files CONFIG.SYS and AUTOEXEC.BAT from the hard disk root directory to a formatted system diskette.

Follow these steps to boot from the system disk.

  - a. Switch off your computer.
  - b. Make sure that your system disk is in the A drive.
  - c. Switch on your computer.
  - d. Wait a moment. Does your computer boot normally?

20. Make a copy of A:\AUTOEXEC.BAT on your floppy disk, and call it MEMO.TXT.
21. Make a copy of A:\CONFIG.SYS on your floppy disk and give it your name with the extension TXT (for example, JOHN.TXT).
22. Rename MEMO.TXT as MEMO\_2.DOC.
23. Copy ALL the files in the C:\DOS directory with the .INI extension to your floppy disk. (hint: use a wildcard).
24. Copy your disk to another floppy disk, and compare the result. Are the disks the same?
25. Print a copy of MEMO\_2.DOC on a printer.
26. Display the contents of the file <Yourname>.TXT on the screen. What is written in the third line of the file?
27. Write the command to find information about the COPY command.
28. You are in the C:\ directory. Write the command to list all the files in the A:\DOS directory, in a wide format.
29. What must you be sure about when you try to delete a directory using RD?
30. Write the commands to create, move, and copy a directory.
31. Which file contains your PATH setting?
32. Write the command to change from drive C to drive E.
33.
  - a. Take a blank formatted floppy disk and change its label to DOS\_BOOTUP.
  - b. Place the DOS\_BOOTUP diskette in your floppy disk drive. Move to the drive (A:\).
  - c. Create a directory called QWERTY which has three sub-directories called '1', '2', and '3'. Write down all the steps you use.
  - d. Copy the file C:\DOS\EDIT.COM to the directory called '3' on your floppy disk. Write down all the steps you use.
  - e. Copy all the files with extension CPI in C:\DOS\ to the directory called '1' on your floppy disk. Write down all the steps you use.
  - f. Delete the '2' directory on your floppy disk.
  - g. Create a sub-directory of the '1' directory which is called ASDF. Write down the commands you use.
  - h. Check the condition of the floppy disk. Which command did you use?
34. Which files does DOS read when your computer boots?
35. Which command in CONFIG.SYS allows DOS to access the high memory area?



- 36.** What is the country code for:  
**a.** the UK? **b.** your country?
- 37.** Which command in CONFIG.SYS allows DOS to access the upper memory blocks?
- 38.** How do you tell DOS where to store temporary files?
- 39.** You want to run a program that is not in the current directory. Where will DOS look to find the program?
- 40.** What does SMARTDRIVE do?
- 41.** Your mouse works in Windows, but not in DOS. Give one possible reason.
- 42.** What is a batch file?
- 43. a.** Write the meaning of each line in this file. Use the HELP command if you are not sure what a particular command does.
- ```
@ECHO OFF
REM This is DISPLAY.BAT
CLS
TYPE A:\AUTOEXEC.TXT
PAUSE
CLS
COPY A:\AUTOEXEC.TXT A:\AUTOEXEC.OLD
DIR A:
PAUSE
CLS
VOL
VER
```
- b.** Save the file as C:\DISPLAY.BAT.
- c.** Create a file called AUTOEXEC.TXT on a floppy disk. Write your name in the AUTOEXEC.TXT file.
- d.** Move to C:\.
- e.** Make sure your floppy disk is in the drive.
- f.** Run DISPLAY.BAT. Does your batch file do what you expected?

**A**

AGP (Accelerated Graphics Port) 21, 38  
Altair 9  
AMD 20  
AMD ATHLON 20  
American Standard Code for Information Interchange 57  
Antivirus 46, 47, 51  
Arrow keys 25  
ASCII 57, 68  
ASP (Active Server Pages) 46  
Assembly 48  
Atanasoff 9  
ATTRIB 67  
AT Attachment (ATA) 21  
AUTOEXEC.BAT 70

**B**

Backspace key 26  
Basic 48  
BeOS 41  
binary digit 12  
binary term 12  
BIOS 6  
Bit 12  
Blaise Pascal 8  
Boot sector 31  
Boot Sequence 69  
bus 19  
bus arbitrator (chipset) 19  
Bus Speed 19  
Bus Width 19  
Byte 15

**C**

C 49  
C++ 50  
CAD 43, 44  
CAD (Computer Aided Design) 10  
Caps Lock 26  
case 24, 25, 26, 33  
Cassette Tape 33  
CD-ROM 33  
Charles Babbage 9  
CHKDSK 61  
CLS 67, 70, 71, 78

COBOL 36, 48, 51  
COM1 7, 6, 19  
COM2 19  
Command 56, 57  
Command prompt 56, 60, 68  
CONFIG.SYS 72  
Conventional Memory 69  
COPY 57, 65  
CPU 18, 19, 20, 36  
CPU (Central Processing Unit) 20  
Ctrl key 25  
Current directory 56, 62  
Current drive 55, 60, 68  
Cursor 57

**D**

data 18  
Database 10, 20, 27, 43  
Data rate 32  
DATE 67, 68  
DEL 66  
Delphi 51  
DELTREE 63  
desktop 7  
Digital Camera 18, 19, 27  
DIR 56, 62, 73  
Directory 56  
DISKCOMP 61  
DISKCOPY 60, 75  
Disk drive 55, 57, 62, 76  
DOSKEY 68  
Dot Matrix Printers 30  
Drawing 44, 47  
Driver 57  
dumb terminal 7  
DVD-ROM 33

**E**

EDIT 64  
EISA 19  
End key 26  
ENIAC 7, 8, 9  
Enter key 25  
ERROR AND WARNING MESSAGES 75  
Escape key 26  
Ethernet card 22  
Exabyte 12

Expanded Memory 69, 72  
expansion slot 19  
Extension 55

**F**

FAT (File Allocation Table) 55, 59  
File 54  
Filename 54  
File attribute 55  
Floppy Disk 32  
FORMAT 59, 74  
Fortran 49  
Function keys 24

**G**

Game 46  
Gigabyte 12  
Graphical User Interface (GUI) 21, 36

**H**

Hardware 6  
hard disk 31  
HELP 73  
Hermann Hollerith 9  
High-level language 47, 48, 49, 50  
Home key 25

**I**

i80486 20  
i8086 20  
Inkjet Printers 30  
Insert key 26  
Integrated Circuit 8, 19  
Integrated Drive Electronics (IDE) 21  
Internet 45  
iPentium 20  
iPentium-II 20  
iPentium-IV 20  
iPentiumPro 20  
ISA 19, 21

**J**

Java 50  
Joystick 28, 46

**K**

keyboard 24  
Kilobyte 12

## L

LABEL 60  
laptop 7, 19, 23  
laser printer 44  
Laser Printers 30  
Light pen 29  
Linux 36, 39, 59  
low-level formatting 32  
Low-level language 47  
LPT1 19  
LPT2 19

## M

Mac OS 32  
mainboard 14, 19, 23, 31  
mainframe 7, 51  
MD 62  
Megabyte 12  
Microphone 22, 28  
Microprocessor 8, 19, 20, 22  
modem 14, 23  
Monitor 30  
Motorola 68000 20  
Mouse 28  
MOVE 66  
MS-DOS 54  
Multimedia 45

## N

Network operating system 37  
Novell NetWare 39

Numeric Keypad 27  
Num Lock 27

## O

Operating Systems 36  
OS/2 39

## P

Page Layout 44  
Page Down key 25  
Page Up key 25  
palmtop 23  
parallel port 19  
Parameter 56  
Partition 55  
Pascal 49  
PATH 68, 70, 71  
Path 53, 56  
Pause key 26  
PC 8  
PC-DOS 37  
PCI 21  
PCMCIA 19, 23  
Peripheral Component Interconnect (PCI) 21  
Petabyte 12  
PlayStation 10  
Plotter 31  
PowerPC G4 20  
Presentation 43  
PRINT 57, 67  
Printer 30  
Print Screen key 27  
Program 54  
Programming 47

Programming language 47  
PROMPT 68

## R

RAM 6, 14  
RAM (Random Access Memory) 20  
RD 57, 63  
REN 66  
Root directory 56

## S

Scanner 28  
Seek time 32  
serial port 19  
Seymour Cray 9  
Shift key 26  
Small Computer System Interface (SCSI) 22  
Softwarfe 14  
Spacebar 25  
Speaker 31  
Spreadsheet 42  
Subdirectory 56  
system unit 18

## T

Tab key 27  
Terabyte 12  
TIME 67  
Touch screen 29  
Transistor 8  
TREE 62  
TSR 54  
TV card 23  
TYPE 64

## U

UNDELETE 66  
UNIVAC 9  
UNIX 39  
USB (Universal Serial Bus) 19  
User 54  
Utility 46

## V

Vacuum Tubes 8  
VER 67, 71  
Version 56  
VIA 20  
Visual Basic 51  
Visual C++ 51  
VL-bus 21  
VOL 61

## W

WebCam 29  
Wildcard 56  
Windows 95 37  
Windows 98 38  
Windows 9x 37  
Windows NT 40  
Windows XP 40  
Word Processor 41

## X

XCOPY 63

## Z

Zip Drive 33

# BIBLIOGRAPHY

1. Borland, Russell. Running Microsoft Word 97. Microsoft Press, 1997.
2. Dodge, Mark, Chris Kinata, and Craig Stinson. Running Microsoft Excel for Windows 95. Microsoft Press, 1995.
3. Finlay, Mark. Getting Graphic. M&T Publishing, 1993.
4. Gookin, Dan. DOS for Dummies. IDG Books Worldwide, Inc., 1994.
5. Gookin, Dan. PCs for Dummies. IDG Books Worldwide, Inc., 1996.
6. Koffman, Elliot B. 4th ed. Pascal Problem Solving and Program Design. Addison-Wesley Publishing Company, Inc., 1993.
7. Livingston, Brian. Windows 3.1 Secrets. IDG Books Worldwide, Inc., 1992.
8. Microsoft Office 2000 Step by Step. Microsoft Press, 1999.
9. Teach Yourself Windows 95 Visually. Marangraphics, 1996.