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# English for Computing Students



**English for Students of Computing  
Booklet of Activities in English  
First Year Students**



## **Introduction**

This Course “English for Computing Students” is aimed at students enrolled in Computing degrees. It is devised as a textbook to be used mainly in the classroom, although some parts of it may be used for private study. The aim of this course is twofold: to improve reading skills through extensive practice, and to consolidate and improve grammar use. To these ends, this textbook presents the student with a collection of texts on a range of topics of general interest on computing. On the other hand, it provides a review of grammar and vocabulary at an intermediate level, and expands on them to help students to find their way about the English used in the field of computing.

This textbook is organized in two main sections. The first one, “Reading Practice”, consists of ten reading units in which texts are exploited through a variety of tasks, such as comprehension, vocabulary and translation exercises. Most of the texts have been especially written for language learners, but some authentic texts have also been included. The second part, “Language Practice”, includes three units on crucial language topics. A typical language practice unit contains a presentation of the language point in question, where it is reviewed and new structures and forms are introduced, and a series of tasks to practice them.

Reading tasks provide practice of reading strategies, but also of technical and semi-technical vocabulary. This textbook also pays special attention to grammatical structures which are typical of the written language, as most students of computing will have to read texts in English at some time during their degree courses.

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# **Reading and Study Skills**

## **Introduction**

Reading, basically, is a physical process of comprehending a text using our eyes. However, reading becomes studying when it is done with the involvement of all the mental faculties of concentration, comprehension and analysis. Studying involves the practices of answering questions, note taking, note making, summarizing, reading the text more than once and analyzing the written words thoroughly. The purpose of reading is to understand the material as effectively as possible to retain the information for a long time. When we study, we spend some time learning about a particular subject or subjects, for example: He went to the university, where he studied Computers and Economics. However, we have to understand that we may only read and not study as we do while reading a newspaper, a magazine or a novel, which we read to pass time, for enjoyment or as a hobby. Nevertheless, we cannot study something without reading or observing it. You read your course books as well as study them. The weather department observes the weather and studies it, but it cannot read the weather. In short, we can say to study is to read, to observe or to know the information in-depth. To strengthen reading as well as study skills, reading comprehension, note taking and note making skills should be nurtured carefully.

## **Reading Comprehension**

Reading is an interactive process between the reader and the text, resulting in comprehension of the text read. Reading comprehension is the ability to understand fully the sense and the meaning of a written or a printed matter. Linguists have shown that the four language skills—listening, speaking, reading and writing—are interrelated. Good listening generates good speaking and good reading generates good writing. Reading is an activity that involves greater level of mental as well as physical concentration. As eye muscles are actively involved in the process, reading stimulates them. The habit of reading also helps readers interpret new words and phrases that they come across in day-to-day conversation. Reading affects our mind; so, whatever we read should be a quality material. A systematic audible reading can improve oral communication too. Above all, reading enhances knowledge and information, entertains us and helps us pass our leisure time. Reading is, undoubtedly, a paramount skill of language.

## Types of Reading Skills

A study of the major types of reading skills may assist you in improving your reading comprehension as well as in employing the required skill for different reading situations. It has been found that these skills are used naturally when we read something in our native language but are often forgotten while reading a foreign language. Such types can be categorized into the following headings:

**Scanning:** Scanning is reading something rapidly for some specific piece of information. You can use this skill when you are in search of key words, for example, scanning a telephone book or a dictionary to look for a name or a word. You ‘see’ every item on the page but you do not necessarily read all the pages—you skip anything you are not looking for. You just have to concentrate on the key word and need not recall the exact content of the page. Scanning saves time but it has to be done with accuracy. This skill develops with practice.

**Skimming:** Skimming is reading a text quickly to gain a general impression whether the text is of any use to you or not. You can see people skimming through books in a bookstore before they decide to buy them. You need not necessarily search for a specific item or a key word and many parts of the material may be left unread. The purpose of skimming is to get an ‘overview’ of the text that is to check its relevance, grasp its central theme and the main points. It prepares you for the more concentrated effort of detailed reading, which is to follow, if the text is useful.

**Intensive Reading:** Reading intensively is to read for detailed information when the aim is to understand the material in-depth. The techniques of scanning and skimming are good launching pads for an in-depth reading.

**Extensive Reading:** Extensive reading is another device often used when we read for pleasure with emphasis on understanding the overall meaning. It is a lighter type of reading, and it may be used at the time of leisure. This form does not generally require detailed concentration, but it should be done with proper understanding. Extensive reading may involve a lot of skimming like skipping boring and irrelevant passages. An average light reading speed is 100–200 words per minute (WPM); however, you can read at a pace in which you feel comfortable.

**Word for Word Reading:** This type of reading is generally not recommended but sometimes its use becomes indispensable, when some textual material is not readily understood and it requires a slow, careful and analytical reading. People use this type of

reading to understand unfamiliar words, concepts, scientific formulae, etc.

For example, going through a legal document, analyzing a written contract or reading a passage for writing a précis, may require such kind of reading. This sort of reading is time consuming and it demands a high level of concentration.

**Speed Reading:** Speed reading is a skill that is acquired after much reading practice. In skimming and extensive reading you skip some points and items to gain speed, whereas in this type of reading, speed has to be attained without skipping. You read everything, taking into each detail, but develop speed simultaneously through practice. The more you read, the more your mind adapts itself to this sort. Students appearing for entrance tests for various professional courses have to speed read passages for comprehension. It is a test of their effective grasping of information with time constraints. A good way to increase your reading speed is to adjust the focus of your eyes at one particular word and then zoom at it in a way that you are able to see the whole text. Using this process, you may increase your reading speed by increasing the number of words you take in at each eye stop.

## **Reading Comprehension Skills**

Reading comprehension means understanding an idea of a text in its wholeness. It involves interpreting the meaning of words in the prevailing context. When you read a passage closely, make an effort to follow its idea and purpose and at the same time try to understand the writer's thought process. Students are made to practice comprehension in classes to develop their reading as well as understanding skills. How well you understand a comprehension passage depends on how well you read. By solving such exercises you are, in fact, preparing yourself for a good professional environment, where you will be required not only to grasp messages of written texts but also to respond to them. A good comprehension helps you interpret things in the right context. On the other hand, a poor comprehension may cause misinterpretations.

The following are some practical hints to help you inculcate reading comprehension skills:

- Skim the passage cautiously for overall understanding and to grasp the main idea.
- Read it for the second time for intensive reading to get the contextual meaning of words, phrases, sentences and writer's thought process.
- Read silently and do not mutter or hum words aloud.



- Use the ‘study reading speed’ of about 200–300 WPM. However, you may increase it with practice, which is surely a good sign, but it should not be at the cost of understanding.
- Go through the questions carefully.
- Read the passage for the third time looking for the answers of the given questions.
- Answer the questions in the given order. Come back to the unanswered questions later on.
- Answer to the point even if the answer is in a few or just one word. Follow the given word limit.
- Check your answers for correctness, grammar, spelling and relevance.

# Reading Practice

## Unit 1 Psychology and Computing

### A. Reading Practice

It may seem that two disciplines like computing and the psychology of reading have little in common. However psychology in general has been profoundly influenced by computing and artificial intelligence. The basic assumption of cognitive psychology is that the mind can be described as if it were a computer, albeit a rather strange one: one widely accepted view is that the mind is a serial von Neumann virtual machine implemented on massively parallel hardware.

10 In the psychology of reading in particular a number of concepts have been imported from computer science. For example it has become normal to talk about two basic strategies for interpreting a written text: bottom-up strategies and top-down  
15 strategies. If a reader uses a bottom-up strategy she interprets the signs on paper to construct her interpretation of a text. If she uses context or her knowledge of the world to work out meaning, she is said to follow a top-down strategy. The importance of this background knowledge in the reading process has been evident since, at least, the 1930s, but the first attempts to formalize its contribution to the understanding of  
20 new information were made in the sixties by computer scientists working in the field of artificial intelligence. In AI this back-up information into which details of new information are fitted receives several names such as *scripts*, *mental models* or, more commonly *frames*.

20 In the seventies a number of important psychologists held that top-down strategies were the most fundamental in the reading process. They claimed that the reader only refers to the text to confirm or disconfirm her hypotheses. Empirical evidence has shown that this is not true. Currently psychologists believe that both top-down and bottom-up processes are fundamental to reading and that good readers are characterised by automatic word recognition. Moreover good readers are more flexible in their approach to reading, they adopt different reading strategies for different texts and different purposes. The extensive use of top-down strategies is now known to be a characteristic of poor readers.

30 If we apply these findings to the situation of people learning to read in a second or foreign language, we can see that one of the main problems they will come up against will be the acquisition of a large vocabulary that they can recognise automatically. The best way to attain a large vocabulary is by reading as much as possible. It also follows that a person studying a second language must have a thorough command of the grammatical system of the language they are studying. It is likely that a good reader who is learning to read in a second language will use top-down strategies more extensively than she would if she were reading in her first language. We hope that this text will help you to organize your study of English at our University

**1. Decide whether the following statements are true or false according to the text you have just read. If they are false, you must change them so that they become true. If they are true, give the lines where the text provides the relevant information that justifies your choice.**

1. Although computing has influenced cognitive psychology, it has not had an important influence on the psychology of reading.
  
2. Today we know that good readers make exclusive use of bottom-up strategies to extract meaning from texts.
  
3. In the past investigators believed that top-down strategies were basic to the reading process.
  
4. Poor readers use top-down strategies too often.
  
5. A good reader who is reading in a second language will probably use more top-down strategies than he does in his first language.

**2. What words in the text do the following words refer to?**

1. it (l. 4) .....
2. it (l. 8) .....
3. she (l. 10) .....
4. its (l. 14) .....
5. they (l. 33) .....
6. it (l. 33) .....

**3. Give synonyms for the following expressions:**

1. However (l. 2) .....
2. profoundly (l. 2) .....
3. albeit (l. 4) .....
4. widely (l. 5) .....
5. concepts (l. 7) .....
6. uses (l. 10) .....

7. construct (l. 11) .....
8. work out (l. 12) .....
9. commonly (l. 18) .....
10. held (l. 19) .....
11. shown (l. 22) .....
12. Moreover (l. 24) .....
13. attain (l. 31) .....
14. likely (l. 34) .....

**4. Read the following text and fill in the gaps with suitable words from the box.**

<b>on the other hand</b>	<b>argue</b>	<b>about</b>	<b>field</b>	<b>goes on</b>
<b>computer scientists</b>	<b>means</b>	<b>behavior</b>	<b>to</b>	<b>approach</b>
<b>computer science</b>	<b>the mind</b>	<b>but rather</b>	<b>whether</b>	<b>each one</b>

**Cognitive Science: At the Crossroads of Computers and the Mind**

[...] First, what exactly is cognitive science? Cognitive science is the study of the mind. The problem is that *mind* (1) ..... different things to different people. To a computer scientist, (2) ..... might be something that can be simulated through software or hardware. So, cognitive science would be synonymous with artificial intelligence. (3) ....., to a cognitive psychologist, the mind is the key to understanding human or animal behavior. (4) ..... a cognitive neuroscientist, the mind is (5) ..... the brain and its neurological underpinnings. To a philosopher of mind, cognitive

science is the culmination of thousands of years of philosophical tradition. To a cognitive linguist, cognitive science is about how thinking and language interact. The list (6) ..... There are countless subfields of cognitive science, and (7) .....has a unique view on what cognitive science is.

Cognitive science as a (8) ..... has been around since the 1950s, when (9) ..... teamed up with psychologists and linguists to develop models of the human mind and human (10) ..... What emerged was the information processing (11) .....to human cognition, in which the mind was viewed as a type of central processor of serial mental operations. This model of the mind borrowed heavily from the functioning of computer hardware. The information processing approach has been the dominant approach in cognitive

science, although it has recently seen strong challenges from neural network modeling. Neural network modelers (12) ..... that the mind does not process information like a single central processing unit (13).....like a massively parallel system of simple processors. Ultimately, (14) .....

cognitive science is seen from a classical information processing or a neural network perspective, it's still the study of the mind, and it still builds heavily on an alliance between psychological and (15) ..... principles.

**5. Translate the following sentences taken from the text:**

1. The basic assumption of cognitive psychology is that the mind can be described as if it were a computer.
  
2. The extensive use of top-down strategies is now known to be a characteristic of poor readers.
  
3. Empirical evidence has shown that this is not true. Currently psychologists believe that both top-down and bottom-up processes are fundamental to reading and that good readers are characterized by automatic word recognition.

## B. Article usage: Generic reference

The way we use articles with nouns having generic reference varies according to the type of noun. More specifically article usage varies depending on whether the noun is:

**countable** or **non-countable**  
(if countable) **singular** or **plural**

Count nouns have a natural plural form, non-count nouns do

not: device	devices
mouse	mice
information	
computing	

There is a clear contrast between non-count nouns and plural nouns, on the one hand, and count singular nouns, on the other:

Computing has changed our world.  
Ø Computers have changed our world.

The computer has changed our world.

When a noun is modified (e.g. by an adjective) and the modifier is placed BEFORE the noun we still usually have a context of generic reference:

**Digital** computers have changed our world.  
**Conventional serial von-Neumann** computers have changed our world.

However when a noun is modified by elements placed AFTER the noun, there tends to be a context of specific reference:

(The) conventional serial computers **based on the von-Neumann architecture** have changed our world.

PRE modification → generic reference → article:

Von-Neumann computers have changed our world

POST modification TENDS to create specific reference:

(The) computers based on the von-Neumann architecture have changed our world.

## EXCEPTIONS

A few adjectives, because of their meaning, imply specific reference:

The best solutions  
The first solutions  
The only problems  
The next generation  
The last problems  
The same solutions

Some non-count nouns have “special” plural forms:

I like water (the substance).  
*I'd like two bottles of water* (two typical quantities of X).

### 1. Fill in the blanks with "the", "a(n)" or “ø”.

1. .... mice and ..... scanners are ..... input devices.
2. .... mouse is ..... pointing device, but ..... scanner is not.
3. .... scanner is used to input text and graphics.
4. .... scanners can be divided into ..... hand-held scanners and ..... desktop scanners.
5. .... hand-held scanner is quite cheap, but ..... desktop scanners are not.

### 2. Read the text below and fill in the blanks with "the", "a(n)" or “ø”.

**I.** Essentially (1) ..... program is (2) ..... form of communication. Its main purpose is to communicate (3) ..... description of (4) ..... process, designed by (5) ..... programmer, to (6) ..... processor which executes it. For (7) ..... successful communication it is necessary to have (8) ..... language which (9) ..... programmers and (10) ..... processors can understand. (11) ..... central processor of a computer can only understand (12) ..... machine code. In (13) ..... machine code each instruction is (14) ..... sequence of zeroes and ones. Although (15) ..... programmer can, with (16) ..... considerable effort, understand and write programs in machine code, it is completely unsatisfactory for the production of large and reliable programs.



**II.** One solution to this problem is (1) ..... translation. We can use (2)..... language which (3) ..... programmer can understand easily and then translate (4) ..... programs written in that language into machine code for (5) ..... execution. (6) ..... natural languages, like English are not suitable for this purpose. It has been more satisfactory to design (7) ..... special languages. In fact there are many of these special languages, which are called (8).....*high level programming languages*.

**III.** 1) ..... first advantage of (2) ..... well-designed high level language is that (3) ..... facilities provided by such (4) ..... language can be adapted to suit (5) ..... different application areas. For example one language can be designed for (6) ..... mathematical computing with a high numerical content, another for (7) ..... commercial applications in which large amounts of (8) ..... non-numeric information need to be processed and a third for applications in which (9)..... computer is used to simulate another system like (10)..... airplane.

**IV.** (1) .....other advantage of (2)..... high level programming languages is that (3) ..... program is easy to read and its structure is clear. This is important because writing a large program is (4) ..... difficult intellectual task and (5).....programmer needs to think clearly about his\her work.

**V.** Finally, with (1) ..... high level languages, it is possible to include features that help (2) ..... programmer to avoid making errors and that aid (3) ..... detection of those errors which are in fact made. Since (4) ..... correctness of (5).....finished product is very important and (6) ..... programmer is (7) .....human being, who has a natural tendency to make errors, the inclusion of these features is (8).....major advantage.

## Unit 2 Computer Essentials

### A. Reading Practice

Computers are electronic machines which can accept data in a certain form, process the data and give the results of the processing in a specified format as information. Three basic steps are involved in the process: *First*, data is fed into the computer's memory. *Then*, when the program is run, the computer performs a set of instructions and processes the data. *Finally*, we can see the results (the output) on the screen or in printed form.

A computer system consists of two parts: hardware and software. **Hardware** is any electronic or mechanical part you can see or touch. **Software** is a set of instructions, called a program, which tells the computer what to do. There are three basic hardware sections: the **central processing unit** (CPU), **main memory** and **peripherals**. Perhaps the most influential component is the **Central Processing Unit**. Its function is to execute program instructions and coordinate the activities of all the other units. In a way, it is the 'brain' of the computer.

The **main memory** holds the instructions and data which are currently being processed by the CPU. The **peripherals** are the physical units attached to the computer. They include storage devices and input/output devices. **Storage devices** (hard drives, DVD drives or flash drives) provide a permanent storage of both data and programs. **Disk drives** are used to read and write data on disks. **Input devices** enable data to go into the computer's memory. The most common input devices are the **mouse** and the **keyboard**. **Output devices** enable us to extract the finished product from the system. For example, the computer shows the output on the **monitor** or prints the results onto paper by means of a **printer**.

On the rear panel of the computer there are several **ports** into which we can plug a wide range of peripherals — modems, a digital camera, a scanner, etc. They allow communication between the

computer and the devices. Modern desktop PCs have USB ports and memory card readers on the front panel.

1. Use the information in the text to help you match the terms in the box with the appropriate explanation or definition below.

<b>software</b>	<b>peripherals</b>	<b>monitor</b>	<b>hard drive</b>
<b>port</b>	<b>hardware</b>	<b>input</b>	<b>output</b>
<b>main memory</b>	<b>central processing unit</b>		

- [.....] 1) The brain of the computer.
- [.....] 2) Results produced by a computer.
- [.....] 3) Magnetic device used to store information.
- [.....] 4) Visual display unit.
- [.....] 5) Devices attached to the CPU
- [.....] 6) Physical parts that make up a computer system.
- [.....] 7) Programs which can be used on a particular computer system.
- [.....] 8) The information which is presented to the computer.
- [.....] 9) Any socket in a computer system into which an external device may be connected.
- [.....] 10) Section that holds programs and data while they are executed or processed.

2. Read these slogans or quotations, and in the space provided write what computer element they refer to.

- 1) a- 'Point and click here for power.'  
 b- 'Obeys every impulse as if it were an extension of your hand.'  
 [.....]
- 2) a- 'Displays your ideas with perfect brilliance.'  
 b- 'See the difference - sharp images and a fantastic range of colors.'  
 [.....]
- 3) a- 'I love this drive. It's quiet and fast.'  
 b- 'With this it's easy to back up your data before it's too late.'  
 [.....]
- 4) a- Tower and speed on the inside.'

**b-** 'Let your computer's brain do the work.'

[.....]

5) **a-** '..... a big impact on the production of text and graphics.'

**b-** 'Your choice: a laser powerhouse.'

[.....]

6) **a-** 'Your fingers will hardly know they're working.'

**b-** 'Choose a full 105-key layout, and type with efficiency.'

[.....]

3. Study the **HELP BOX**, and then use suitable classifying expressions to complete these sentences.

### HELP BOX

**Classifying** means putting things into groups or classes. We can classify types of computers, parts of a PC, etc. Some typical expressions for classifying are:

- ... *are classified into* X types/categories
- ... *are classified by* ...
- ... *can be divided into* X types/categories

**Example:**

Digital computers *can be divided into* five main types: mainframes, desktop PCs, laptops, tablet PCs and PDAs.

- ... *include(s)* ...
- ... *consist(s) of* ...

**Example:**

The basic configuration of a mainframe **consists of** a central system which processes huge amounts of data very quickly.

- There are X types/classes of ...
- X is a type of ...

**Example:**

A tablet PC is a type of notebook computer.

- 1) A computer ..... hardware and software.
- 2) Peripherals ..... three types: input, output and storage devices.
- 3) A word processing program ..... software which lets the user create and edit text.

## Unit 3 New Input Technologies

### A. Reading Practice

Many people in the computer industry believe that computers would be more widely used if they were user friendlier. They argue that many potential users lack basic keyboard skills and so are unwilling to use PCs in their everyday work. This opinion has led many computer manufacturers to dedicate a lot of money to the research and  
5 development of more natural input devices.

One area that has received a great deal of attention is that of pen-based computing. There are a number of systems currently on the market that are aimed at "vertical workers", that is workers that need to input data outside the office in situations which disallow the use of a keyboard. These computers use a pen input system to allow the  
10 user to introduce data and commands.

Some of them incorporate an onscreen keyboard which is activated by means of a pen. Such systems also allow the pen to be used like a mouse: for example the user can highlight an option using the pen and then tap the Execute box or s/he can make use of a side button on the pen, which corresponds to the second button on a mouse.  
15 Other pen-based systems include handwriting recognition programs, enabling the user to write directly onto the screen (the screen is always a flat panel display and nowadays usually an LCD). Most of these programs have a handwriting trainer program to train the system to recognize the user's handwriting. There are basically two classes of handwriting recognition programs: those that recognize only block text  
20 and those that will recognize cursive text; the latter require considerably more computing power.

The problem of the amount of computing power necessary is common to all these systems, which are at present far slower than systems using more conventional input technologies. Moreover these systems still cannot reliably recognize everyone's hand-  
25 writing. However researchers are attempting to overcome these problems, using methods based on Artificial Intelligence, neural networks and fuzzy logic (i.e. a logic which allows more than two truth values).

Another field of research which has received a lot of attention is speech input. Computers capable of recognizing speech can be classified on the basis of their  
30 abilities. Thus a machine may be capable of discrete speech or continuous speech recognition. The speech recognition may be speaker-dependent or speaker-independent. And finally the machine may have a small vocabulary or a large vocabulary.

The problems facing speech recognition are basically two: speech-to-text conversion  
35 (i.e. recognizing what is said) and natural language processing (i.e. understanding what is said). Although these problems can be considered separately, they are interdependent.

Speech-to-text conversion is an enormously complex process since there is such a great diversity in the pronunciation of a given phoneme both between speakers and for an individual speaker. But basically the process is as follows. Samples of speech are picked up every centisecond by means of a microphone and analyzed by a signal processor. The analysis produces a set of features which represent important characteristics of speech in a compact form. These features represent a vector of speech parameters. The incoming vectors are then matched against stored sound

45 patterns or templates. To overcome the problem of diversity in pronunciation, it is normal to use a number of probabilistic techniques taken from statistics and information theory.

50 Natural language processing is also an extraordinarily complicated process and is perhaps one of the most difficult challenges that AI researchers face. The first steps involve sentence parsing (or syntactic analysis) and semantic analysis, in which the structures identified during parsing are interpreted as pertaining to objects in the environment. These two components of NLP are relatively well understood in comparison to the other two basic components: context correlation and pragmatic interpretation. Each of these components requires access to databases that contain extensive knowledge about the world. A central issue in NLP is how this knowledge should be represented.

As far as the amount of computing power required for natural speech recognition and the reliability of the process are concerned, researchers are facing the same problems and are developing the same solutions as in handwriting recognition.

**1. Decide whether the following sentences are true (T) or false (F) according to the text. If they are false, you must change them so that they become true. If they are true, give the lines where the text provides the relevant information that justifies your choice.**

1. Pen-based systems are useful for people who have to work out of doors.
2. With pen-based computers, the screen is used as a keyboard.
3. In natural language processing more progress has been made in syntactic and semantic analysis than in pragmatic analysis.
4. Fuzzy logic is being used to solve problems in natural speech recognition.
5. If computers were easier to use, more people would definitely use them.

**2. What words in the text do the following words refer to?**

1. one area **that** has received (l. 6) .....
2. **Such** systems (l. 12) .....
3. most of **these** programs (l. 17) .....
4. a set of features **which** represent (l. 42) .....

5. **it** is normal to use (l. 45) .....

**3. Give synonyms for or explain the meaning of the following words and phrases.**

1. lack (l. 2) .....

2. led (l. 4) .....

3. research (l. 4) .....

4. a great deal of (l. 6) .....

5. currently (l. 7) .....

6. allow (l. 9) .....

7. considerably (l. 20) .....

8. amount (l. 22) .....

9. Moreover (l. 24) .....

10. attempting (l. 25) .....

**4. Match the following terms with the appropriate explanation.**

1. If you are unwilling to do something	<b>a.</b> you successfully deal with it and control it.
2. If you highlight something	<b>b.</b> a small quantity that is analyzed scientifically.
3. If you overcome something	<b>c.</b> you draw attention to it.
4. A sample of something is	<b>d.</b> a subject that people are arguing
5. Something pertaining to something else is	<b>e.</b> you do not want to do it.
6. An issue is	<b>f.</b> something that belongs or relates to it.

**5.**

**5. Look at how we use verbs like “allow” and “enable”:**

Pen input systems allow the user to introduce data and commands.

Other pen-based systems enable the user to write directly onto the screen.

With these verbs we use the object infinitive construction (it would be incorrect to use a that-clause). “Permit” and “cause” work in the same way. Notice that “let” is a synonym of “allow”, “enable” and “permit”, but it takes the bare infinitive. Similarly, “make” is a synonym of “cause”, but with a bare infinitive. Rewrite the sentences below using one of the verbs above.

1. You can click a button to put the process into operation.

.....

2. With a voice recognition device you can input data by clicking.

.....

3. If you press these two keys, the screen splits into two.

.....

4. With a scanner the user can input printed text easily.

.....

5. If you move the mouse, the cursor moves around the screen.

.....



## Unit 4 Colour Printing

### A. Reading Practice

All the main printing technologies have developed colour printers, but the introduction of colour adds a number of complications that do not exist for black and white printers. Colour printers cannot hold enough types of ink or toner to make a separate one available for each of the many colours that a printer can produce. They therefore

- 5 make use of a small number of primary colours that are either mixed or dithered to create the required output colours.

Colour printers work by combining the three primary subtractive colours, cyan, magenta and yellow, to form the other colours. For example magenta plus yellow produces red, yellow plus cyan forms green and cyan plus magenta produces blue.

- 10 Equal amounts of cyan, magenta and yellow combine to form black. However most colour printers include a separate black colour (called *K* in the printing industry) to generate a truer black. This forms the standard four-colour or CMYK model in the printing industry.

The most usual colour printers print dots of a single colour and of a fixed size. Thus, using the CMYK colour model, they are capable of generating only seven colours (cyan, magenta, yellow, red, green, blue and black). In order to produce the other colours they make use of dithering: they print pixels which are formed by arrays of very small colour dots. When the eye views the document at a distance, it cannot distinguish the individual dots, but combines them to form a composite image. The

- 20 same technique is used in black and white laser printers to generate different grey levels by varying the ratio of black dots to the white paper background.

One drawback of dithering is that due to the use of larger pixels, the output resolution of the printer is reduced. If, for example, a 4 by 4 dot matrix is used for each pixel a printout resolution 300 dpi is reduced to one fourth, or 75 dpi.

- 25 Another problem of colour printing is that in the case of thermal transfer and laser printers, each of the primary colours must be laid down separately. This means that the print head has to make three or four passes over the same sheet of paper. Consequently the alignment of the dot patterns on the paper, or registration, must be precise, since otherwise the colour pattern shifts, and the image becomes fuzzy.

- 30 However the most basic problem facing colour printing is the difficulty of matching printed colour with the colours displayed on screen. The difficulty lies in the fact that these two output devices create colour in fundamentally different ways. The colour we usually see in the real world is reflected light. We perceive printed colour because the pigments in the ink or toner absorb light selectively so that only parts of the spectrum

- 35 are reflected to the eye (hence the term *subtractive* colours applied to the colour used in printing technology). CRT monitors, in contrast, emit light directly by causing red, green and blue (the primary *additive* colours) dots to glow. Thus the two output devices produce different sets, or *gamuts*, of colours. At the moment the computer industry is developing colour management tools in an attempt to ensure colour

- 40 consistency throughout the system and some of these tools are currently included in commercial operating systems. However, it is still not possible to obtain a perfect match between the colours produced by printers and monitors.

**1. Decide whether the following statements are true (T) or false (F) according to the text. If they are false make the necessary changes so that they become true. If they are true, give the lines where the text provides the relevant information that justifies your choice.**

1. Most colour printers cannot store enough different kinds of ink for each colour they produce.
2. By dithering colours, colour printers are able to generate seven colours.
3. One drawback of dithering is that it lowers the printer's resolution.
4. Ink-jet printers need three or four passes to lay down all the colours.
5. All colour printers have a separate black colour.

**2. What words in the text do the following words refer to?**

1. **They** therefore make use (l. 4) .....
2. **they** are capable of (l. 15) .....
3. **it** cannot distinguish (l. 18) .....
4. combines **them** to form (l. 19) .....
5. **it** is still not possible (l. 41) .....

**3. Give synonyms for or explain the meaning of the following words and phrases:**

1. complications (l. 2) .....
2. therefore (l. 4) .....
3. required (l. 6) .....
4. However (l. 10) .....
5. called (l. 11) .....
6. a single (l. 14) .....
7. formed by (l. 17) .....

- 8. arrays (l. 17) .....
- 9. views (l. 18) .....
- 10. technique (l. 20) .....

**4. Match these words that appear in the text with a suitable synonym:**

- 1. drawback            correspondence
- 2. shift                disadvantage
- 3. since                thus
- 4. match                move
- 5. hence                as

**5. Fill in the gaps with one suitable word.**

**Digital Photography and Printing: how to print passport and visa photos**

If digital printers are used to produce passport and visa photographs instead of conventional photographic processes, the photographs produced (1) ..... be high quality and photo-like in appearance. Certain types of digital printers (2) ..... inkjet and dye sublimation can be used to produce high quality passport and visa photos. (3) ..... inkjet printers deposit multi-coloured ink onto photographic print paper, dye sublimation uses heat applied to a multi-coloured ribbon or film to release a dye that is transferred (4)..... photographic print paper. These two (5).....of printers, when used with compatible print paper that produces high resolution images, are suitable for printing passport and visa photos.

## Unit 5

### Mechanical Athletes Totter towards Olympic Glory

#### A. Reading Practice

5 A robot called Yamabico took the prize for the best overall performer at last week's Robot Olympics in Glasgow. Colin Lindsay from the Turing Institute of Strathclyde University, which hosted the games, said that Yamabico, from the Tsukuba University in Japan, took the laurels because it was able to negotiate a path strewn with obstacles without having to stop. Most robots need to scan each obstacle and process that information every time it encounters something in its path. Peter Mowforth, one of the judges from the Turing Institute, said: "Every component in the system was beautifully engineered." Japan now wants to stage the next games for the mechanical athletes.

10 The games, held in the sports hall of the university, got off to a shaky start. Trolleyman, the robot designated to light the Olympic flame, suffered an electrical fault. Instead of carrying the flame from The Parthenon Greek restaurant to the games, the robot's creators had to take the robot to the games in a Land-Rover.

15 The competitors, from schools, universities and amateur groups, seemed dogged by technical hitches. One six-legged robot from the Massachusetts Institute of Technology refused to start its race. Photographers' flashguns blinded the sensors on some robots, disrupting their movements. The electronics in another failed and its designers could not buy the replacement parts they needed.

20 Nevertheless, experts attending the show thought that the effort was worthwhile, both for encouraging school children to take an interest in robotics and for the exchange of information between competitors.

Ruzena Bajcsy, a professor of computer science at the University of Pennsylvania, said: "What we have here represents the efforts of universities and enthusiasts. We don't have robots from the automobile industry or the military. At least in the US, they are the big sponsors."

Bajcsy said that the biggest problem that robotics faces is perception. The aim that she and other experts are pursuing, is to produce a robot that will learn to recognize objects, without having to refer to vast banks of rules they store in their electronic memories. Rule-based systems are rigid and have many shortcomings.

30 Rusell Beale and Tom Jackson from the University of York gave an example of the problem. To recognize a tree according to rules, the robot's memory would contain a description of a tree as an object with a trunk, branches and leaves. If a robot then encountered a palm tree, it would not recognize a tree. It is necessary to train robots so that they would decide that there was a strong possibility that a palm tree was a  
35 tree.

Such an approach often relies on neural networks, computer systems that mimic the way a human brain works. Neural networks can be trained to perform certain types of tasks better than normal computers. A robot with such a vision system would view a variety of objects and when it identifies them correctly, the researcher reinforces the connections in the network which gave the correct answer.

Beale and Jackson are developing neural networks to interpret visual information. They find that putting their equipment on a robot is a good way to test the visual system since it would then encounter a variety of conditions.

**1. Some nouns in English, e.g. e-mail, can be used as verbs: to e-mail. In the text several nouns appear used as verbs. For example, the verb hosted (line 3) from the noun host. Find in the text similar examples of these uses and complete the table below.**

<b>Paragraph 1</b>	<b>1. hosted</b>
	<b>2. ....</b>
	<b>3. ....</b>
<b>Paragraph 6</b>	<b>1. ....</b>

**2. Note the use of the ending –ed to turn nouns into adjectives in certain expressions. The meaning of –ed, in these cases, is similar to with or having. For example, “a robot with six legs” is “a six-legged robot”. Complete the following sentences in the same way:**

1. A man with dark hair is a..... man.
2. A network with 7 layers is a ..... network.
3. A sailor with blue eyes is a .....sailor.
4. A truck-driver with a broad shoulder is a ..... truck-driver.
5. A programming language with types is a..... programming language.

**3. Using the paragraph references given, look back in the text and find words that have a similar meaning to:**

1. organized (§ 1) .....
2. finds (§ 1) .....
3. started badly (§ 2) .....
4. problems (§ 3) .....
5. stopped working (§ 3) .....
6. however (§ 4) .....
7. being present at (§ 4) .....

- 8. keep (§ 6) .....
- 9. defects (§ 6) .....
- 10. depends on (§ 8) .....

**4. According to the passage, are the following statements true (T) or false (F)? If a statement is false, make the necessary changes so that it becomes true. If it is true, give the lines where the text provides the relevant information that justifies your choice.**

- 1. The Robot Olympics were staged in Japan at the Tsukuba University.
- 2. The games started badly because some robots had technical faults with their electronic systems.
- 3. The organisers of the games were not very satisfied because they felt they had hardly contributed to the increase of the interest in robotics.
- 4. Scientists have no idea of how to overcome difficulties in perception.
- 5. Experts rely on neural networks to check the visual system of the robots.

## Unit 6 Memory Technologies

### A. Reading Practice

Every computer system contains a variety of devices to store instructions and data required for its operation. These storage devices plus the algorithms needed to manage the stored information constitute the memory system of the computer. In general it is desirable that processors should have immediate and uninterrupted

5 access to memory, so the time required to transfer information between the processor and memory should be such that the processor can operate at, or near to, its maximum speed. Unfortunately, however, memories that operate at speeds comparable to processor speeds are very costly. It is not possible (except for very small systems) to employ a single memory using only one type of technology. Instead  
10 the stored information is distributed over a variety of different memory units with very different physical characteristics.

The memory components of a computer system can be divided into three main groups:

1. *Internal processor memory*. This comprises a small set of high-speed registers  
15 which are used as a working memory for temporary storage of instructions and data.

2. *Main memory (also called primary memory)*. This is a relatively large, fast memory used for storing programs and data during computer operation. It is characterized by the fact that locations in main memory can be accessed directly and rapidly by the CPU instruction set. The principal technology used for main memory is based on semi-  
20 conductor integrated circuits.

3. *Secondary memory (also called auxiliary or backing memory)*. This is generally much larger in capacity but also much slower than main memory. It is used for storing programs, large data files and the like which are not continually required by the CPU. Information in secondary storage is accessed indirectly via input-output  
25 programs that first transfer the required information to main memory. Representative technologies used for secondary memory are magnetic disks and tapes.

More and more machines employ another type of memory called a *cache*, which serves as an intermediate temporary storage unit logically positioned between the processor registers and main memory.

30 The major objective in designing any memory system is to provide adequate storage capacity with an acceptable level of performance at a reasonable cost.

The cost of a memory unit is usually measured by the price the user has to pay for the complete unit (not only the information storage cells, but also the peripheral equipment or access circuitry that is essential to the operation of the memory). So if  $C$   
35 is the price in euros of a complete memory system with  $S$  bits of storage capacity, the cost  $c$  of memory can be defined as follows:

$$c = \frac{C}{S} \text{ euros/bit}$$

The performance of a memory device is primarily determined by the rate at which information can be read from or written into memory. A convenient measure of performance is the average time required to read a fixed amount of information (e.g. one word) from the memory. This is termed the *read access time* or, more commonly, the *access time* of the memory and is denoted by  $t_A$ . (The write access time is defined similarly; it is typically, but not always equal to the read access time.) Access time depends on the physical characteristics of the storage medium, and on the type of access mechanism used.  $t_A$  is usually calculated from the time a read request is received by the memory unit to the time at which all the requested information is available at the memory output terminals. The *access rate*  $b_A$  of the memory, defined as  $1/t_A$  and measured in words per second is another widely used measure of performance for memory devices.

Although low cost and high access rates are desirable characteristics for memory, they are to a great extent incompatible. Memory units with high access rates are generally expensive, while low-cost memories are relatively slow.

**1. Decide whether the following statements are true (T) or false (F) according to the text. If they are false, make the necessary changes so that they become true. If they are true, give the lines where the text gives the relevant information that justifies your choice.**

1. One of the main problems in designing a memory system is to reconcile cost and performance.
2. The cost of a memory system can be defined as the price of its storage cells divided by its storage capacity.
3. Secondary memory is usually a bit slower than main memory.
4. It is not possible to use only one memory technology in a memory system.
5. The access rate is the average time needed to read a given amount of information from memory.

**2. Give synonyms for the following words and expressions:**

1. variety (l. 1) .....
2. constitute (l. 3) .....
3. costly (l. 8) .....
4. comprises (l. 14) .....
5. and the like (l. 23) .....
6. via (l. 24) .....
7. More and more (l. 27) .....
8. objective (l. 30) .....



- 9. widely (l. 47) .....
- 10. while (l. 51) .....

**3. Find the word or words these pronouns refer to:**

- 1. for **its** operation (l. 2) .....
- 2. **it** is desirable that (l. 4) .....
- 3. **its** maximum speed (l. 6) .....
- 4. **It** is not possible (l. 8) .....
- 5. **It** is used for (l. 22) .....
- 6. **it** is typically (l. 42) .....

**4. Fill in the gaps with one suitable word.**

**A USB (Universal Serial Bus) Flash Drive**

A USB flash drive is a small and portable flash memory that you can (1) ..... to your computer’s USB port. These USB flash drives work as a portable and rewritable data storage (2).....with an enormous storage capacity. Their most relevant advantage is that they are so small (3) ..... can be carried in a pocket and can be plugged into any computer with a USB drive. Besides, they are more durable than previous forms of portable storage (4)..... compact disks and floppy disks as they do not contain any internal moving parts. They are also (5).....pen drives, key drives or simply USB drives.

## Unit 7      Operating Systems

### A. Reading Practice

Because there are many concurrent processes within a computer system, it is necessary to have an executive or master control program; such a program is known as an operating system. The operating system is designed to exercise overall control of the system, scheduling operations, allocating system resources, preventing  
5 interference between programs and so on. In multiuser environments the operating system is oriented towards timesharing, being responsible for the efficient sharing of such resources as CPU time, memory space, IO devices, utility programs and so on. There are also specialized operating systems for computers that require very short response times (real-time systems) and for wide-area networks (transaction-  
10 processing systems).

The basic unit of computing managed by an operating system is a *process* or *task*, a loose definition of which could be a self-contained program module in the course of execution: for instance, a subroutine being executed by a CPU or an IO program being executed by an IO processor might be typical examples of processes. The resources  
15 required by a process, such as a processor and memory space, are usually allocated to it dynamically during execution.

Some processes are created in response to user commands to the operating system, others are created by other processes. While in existence, a process has three major states: ready, running and blocked. In a ready state a process is waiting, perhaps in a  
20 queue with other processes, for the resources it needs to enter the running state. A blocked process is waiting for some event to occur, such as completion of some other process that provides it with necessary data. A transition from one state to another is triggered by various conditions such as interrupts and user instructions to the operating system. When no longer needed, a process (but not the underlying  
25 program) can be deleted via the operating system so that any resources currently allocated to it are released.

An operating system contains huge amounts of software, as it is made up of a large number of computer resource management programs such as processor scheduling routines, virtual memory routines and IO device control programs. Moreover some  
30 commonly used utility programs like programming language translators, text editors etc. are often considered part of the operating system and are invoked via commands to it. All of this software is far too much to store in main memory in its entirety. As a result the less frequently used parts of the operating system such as file management routines and compilers reside in secondary memory, and are only brought into main  
35 memory when needed. The other portion of the operating system consisting of the most frequently used parts remains continuously in main memory and is termed the *kernel*.

The kernel is responsible for creating, deleting and state-switching the many processes that define the computer's behaviour. It does so by responding to a steady  
40 flow of interrupt requests coming from a variety of sources, such as user-generated requests for operating system services, memory allocation/deallocation requests, IO operations, etc. It achieves a rapid response by only briefly disabling other interrupts while responding to the current one, then dispatching or creating an operating system process to execute the appropriate interrupt-handling routine. The performance and  
45 reliability of the kernel can be improved by implementing some of its more basic functions in the hardware or firmware.

**1. Decide whether the following sentences are true or false according to the text. If they are false, change them so that they become true. If they are true, give the lines where the text provides the relevant information that justifies your choice.**

1. Compilers are normally stored permanently in primary memory.
2. When a process is not needed it may be erased.
3. All operating systems are transaction-processing systems.
4. Some processes can come into being as a result of user instructions.
5. If a process is ready, it may be waiting in a queue.

**2. Give synonyms for the following words and expressions that come up in the text:**

1. because (l. 1) .....
2. concurrent (l. 1) .....
3. overall (l. 3) .....
4. designed (l. 3) .....
5. major (l. 18) .....
6. occur (l. 21) .....
7. provides (l. 22) .....
8. deleted (l. 25) .....
9. via (l. 25) .....
10. so that (l. 25) .....
11. released (l. 26) .....
12. huge (l. 27) .....
13. amounts (l. 27) .....
14. made up of (l. 27) .....
15. like (l. 30) .....

- 16. as a result (l. 32-33).....
- 17. termed (l. 36) .....
- 18. remains (l. 36) .....
- 19. steady (l. 39) .....
- 20. achieves (l. 42) .....

**3. Decide whether the words in bold type point forwards or backwards in the text.  
What words or expressions do they refer to?**

- 1. **others** are created (l. 18) .....
- 2. **it** needs (l. 20) .....
- 3. that provides **it** (l. 22) .....
- 4. as **it** is made (l. 27) .....
- 5. are invoked...to **it** (l. 31) .....

## Unit 8      Networks

### A. Reading Practice

There are many kinds of computer networks. A major distinction can be made between *terminal-based* networks and *computer-based* networks. Terminal-based networks are characterized by the presence of a centralized computer that communicates with a large number of remote terminals. The terminals can range from

5 general-purpose terminals with keyboard and screen to highly specialized devices.

They perform two main functions: local data processing tasks and the processing needed to communicate with the central computer. An example of a terminal-based network is found in a large department store where many points-of-sale are linked to a central computer. Terminal-based systems with thousands of terminals can also be

10 found, for example, computer networks used for airline reservations. One of the earliest computer networks was the American Airlines SABRE (*Sales and Business Reservations done Electronically*) reservation system built in the 1960s. This prototype of all subsequent reservation systems linked over a thousand terminals scattered throughout the United States to a central computer system maintaining all

15 the airline's flight information.

Computer-based networks, on the other hand, are characterized by the presence of multiple distributed computers with decentralized control. This type of network is used extensively for the transmission of files, including e-mail messages, among users of different computers on the network. Where communication distances less than a few

20 kilometres are involved, for instance, a computer network within a single building or university campus, the term *local area network* (LAN) is used. LANs often employ data-transmission links (electrical or optical cables) that are private to the network in question. For computer networks spread over large geographical areas, sometimes termed *wide-area networks* (WANs), the data-transmission facilities are typically

25 supplied by communications companies called *common-carriers*, which in many countries are government-owned or -regulated organizations. The various national and international telephone networks are extensively used for both local and long- distance computer communications, but they are increasingly being supplemented by networks designed specifically for digital data transmission. Like the telephone

30 networks, these *public data networks* are composed of a heterogeneous mixture of electrical, optical and microwave links.

Communications costs are major contributors to the total cost of using a wide-area computer network. There are various techniques for sharing the long-distance communication links to reduce these costs. The establishment of a dedicated

35 communication path from source to destination for each information exchange is called *circuit or line switching*. It is the usual mode of communication used in the public telephone network. Circuit switching is established by dialling and implemented by telephone exchanges. It has the disadvantage that once a path is established between two locations, it cannot be used by other potential users along the path,

40 even if the utilization of that path is very low.

The problem can be overcome by a technique called *message switching*, whereby intermediate switching centres on a long communication path are used to store data and subsequently forward it to the next destination, a process called *store-and-forward*. Messages are collected at each switching centre where they are organized in

45 a manner that makes efficient use of the data paths connected to that centre. Compared with circuit switching, message switching can provide a substantial increase in communication link utilization.

**1. Decide whether the following sentences are true (T) or false (F) according to the text. If they are false, make the necessary changes so that they become true. If they are true, give the lines where the text provides the relevant information that justifies your choice.**

1. Common-carriers are always regulated or owned by the government.
2. The SABRE network connected more than a thousand terminals all over the USA.
3. WANs must use the communications facilities provided by common-carriers.
4. Circuit switching ensures an optimum use of the communication path.
5. With message switching messages are stored at different switching centres before reaching their destination.

**2. Explain the meaning of or give synonyms for the following words:**

1. remote (l. 4) .....
2. needed (l. 7) .....
3. linked (l. 8) .....
4. scattered (l. 14) .....
5. supplied (l. 25) .....
6. designed (l. 29) .....
7. major (l. 32) .....
8. techniques (l. 33) .....
9. overcome (l. 41) .....
10. forward (l. 43) .....

**3. What words or expressions do the words in bold type refer to?**

1. **They** perform two main functions (l. 6) .....
2. **that** are private to the network (l. 22) .....
3. **which** in many countries are (l. 25 ) .....

4. **it** has the disadvantage (l. 38) .....
5. forward **it** to the next destination (l. 43) .....

**4. Using affixes or suffixes form a new word from the word in brackets:**

1. Multimedia will rely on new forms of data..... (store).
2. Don't..... (plug) the PC, I haven't quitted the program.
3. The ..... (process) stage takes place before processing and the ..... (process) stage takes place afterwards.
4. We can be sure of the ..... (accurate) and ..... (rely) of the data.
5. Many users are .....(grade) to Word 1 April 2010.
- 6.(compute) is big business.
7. They finally reached an .....(agree).
8. Rapid data .....(retrieve) is the essence of a good database.
9. The..... (delete) operation was very useful for moving text in MS DOS.
10. They said that there was no ..... (likely) of the ..... (perform) being repeated.

**Remember that in English verbs of permitting and enabling cannot take a that clause, they must take an object infinitive clause. This means that sometimes we must use a passive infinitive:**

The mouse allows the user to move the cursor.

The program allows back-ups to be made automatically.

## Unit 9 Multiprocessors

### A. Reading Practice

A multiprocessor is a computer system characterized by the presence of several CPUs or, more generally, processing elements (PEs), which cooperate on common or shared computational tasks. Multiprocessors are distinguished from multicomputer systems and computer networks, which are systems with multiple PEs operating independently on separate tasks. The various PEs making up a multiprocessor typically share resources such as communication facilities, input-output devices, program libraries, databases etc., and are all controlled by a common operating system.

The two main reasons for including multiple PEs in a single computer system are to improve performance and to increase reliability. Performance (i.e. throughput) improvement is obtained either by allowing many PEs to share the computation load associated with a single large task, or by allowing many smaller tasks to be performed in parallel in separate PEs. A multiprocessor composed of  $n$  identical processors is an example of a  $n$ -unit processor that can, in principle, provide  $n$  times the performance of a comparable single-unit system or uniprocessor. A major goal in designing  $n$ -processor systems is to obtain a speedup  $S(n)$  that is as near to  $n$  as possible. System reliability is improved by the fact that failure of one CPU need not cause the entire system to fail. The functions of the faulty processor and its local resources can be taken over by the other processors; consequently multiprocessors allow fault-tolerance to be incorporated into the system. Of particular interest is the ability of fault-tolerant multiprocessors to operate correctly at a reduced or degraded performance level in the presence of hardware or software failures, a property called *graceful degradation*. By enabling such facilities as secondary memory units and system software to be shared efficiently, a multiprocessor architecture can lead to significant reduction in overall system cost.

Multiprocessors can be classified by the organization of their main-memory systems. If main memory, or a major portion of main memory, can be directly accessed by all the PEs of a multiprocessor, the system is termed a shared-memory computer, and the shared portion of main memory is called global memory. Information can therefore be shared among the processors simply by placing it in the global memory. Distributed-memory computers, on the other hand, have no global memory. Instead each processing element has its own private or local main memory. Distributed memory systems share information by transmitting it in the form of messages between the local memories of different processors; such message passing requires a series of relatively slow input-output operations. Shared-memory and distributed-memory multiprocessors are also called tightly coupled and loosely coupled, respectively, reflecting the speed and ease with which they can operate on common tasks.

**1. Decide whether the following statements are true or false. If they are false make the necessary changes so that they become true. If true, give the lines that justify your choice.**

1. Multiprocessors are computer systems characterized by the presence of several PEs operating on different computational tasks independently.
2. One of the principal goals of multiprocessing is to ensure that the whole system continues to work despite the fact that one of its PEs goes down.



3. One way in which multiprocessors obtain better performance is to split up the computations necessary for a task among several PEs.
4. By sharing certain facilities efficiently, graceful degradation may make the cost of the overall system smaller.
5. In tightly coupled multiprocessors each PE has its own memory.

**2. What do the following words or expressions refer to in the text?**

1. **which** cooperate (l. 2) .....
2. are **all** controlled (l. 7) .....
3. **its** local resources (l. 17) .....
4. **their** main-memory systems (l. 25) .....
5. with **which** they can operate (l. 36) .....

**3. Give synonyms for or explain the meaning of the following words and expressions taken from the text:**

1. tasks (l. 3) .....
2. making up (l. 5) .....
3. a single (l. 8) .....
4. improve (l. 9) .....
5. obtained (l. 10) .....
6. performed (l. 11) .....
7. major (l. 14) .....
8. near (l. 15) .....
9. lead to (l. 23) .....
10. on the other hand (l. 30).....

**4. Read the text again to fill in the table below.**

Multiprocessors	
<b>Definition</b>	.....
<b>Basis of classification</b>	.
<b>Type 1</b> .....	Described in line(s) .....
<b>Type 2</b> .....	Described in line(s) .....
<b>Aim of multiprocessors 1</b>	Described in line(s) .....
<b>Aim of multiprocessors 2</b>	Described in line(s) .....

## Unit 10 The Web

### A. Reading Practice

The Internet isn't just about email or the Web anymore. Increasingly, people online are taking the power of the Internet back into their own hands. They're posting opinions on online journals - weblogs, or blogs; they're organizing political rallies on **MoveOn.org**; they're trading songs on illegal file-sharing networks; they're volunteering articles for the online encyclopedia **Wikipedia**; and they're collaborating with other programmers around the world. It's the emergence of the 'Power of Us'. Thanks to new technologies such as blog software, peer-to-peer networks, open-source software, and wikis, people are getting together to take collective action like never before.

**eBay**, for instance, wouldn't exist without the 61 million active members who list, sell, and buy millions of items a week. But less obvious is that the whole marketplace runs on the trust created by eBay's unique feedback system, by which buyers and sellers rate each other on how well they carried out their half of each transaction. Pioneer e-tailer **Amazon** encourages all kinds of customer participation in the site - including the ability to sell items alongside its own books, CDs, DVDs and electronic goods. **MySpace** and **Facebook** are the latest phenomena in social networking, attracting millions of unique visitors a month. Many are music fans, who can blog, email friends, upload photos, and generally socialize. There's even a 3-D virtual world entirely built and owned by its residents, called **Second Life**, where real companies have opened shops, and pop stars such as U2 have performed concerts.

Some sites are much more specialized, such as the photo-sharing site **Flickr**. There, people not only share photos but also take the time to attach tags to their pictures, which help everyone else find photos of, for example, Florence, Italy. Another successful example of a site based on user-generated content is **YouTube**, which allows users to upload, view and share movie clips and music videos, as well as amateur videoblogs. Another example of the collective power of the Internet is the **Google** search engine. Its mathematical formulas surf the combined judgments of millions of people whose websites link to other sites. When you type Justin Timberlake into Google's search box and go to the star's official website, the site is listed first because more people are telling you it's the most relevant Justin Timberlake site - which it probably is.

**Skype** on the surface looks like software that lets you make free phone calls over the Internet - which it does. But the way it works is extremely clever. By using Skype, you're automatically contributing some of your PC's computing power and Internet connection to route other people's calls. It's an extension of the peer-to-peer network software such as BitTorrent that allow you to swap songs - at your own risk if those songs are under copyright. **BitTorrent** is a protocol for transferring music, films, games and podcasts. A podcast is an audio recording posted online. Podcasting derives from the words iPod and broadcasting. You can find podcasts about almost any topic - sports, music, politics, etc. They are distributed through RSS (Really Simple Syndication) feeds which allow you to receive up-to-date information without having to check the site for updates. BitTorrent breaks the files into small pieces, known as chunks, and distributes them among a large number of users; when you download a torrent, you are also uploading it to another user.

**1. Refer to the article above to find websites for the following tasks.**

- 1) to search for information on the Web .....
- 2) to buy books and DVDs .....
- 3) to participate in political campaigns .....
- 4) to view and exchange video clips .....
- 5) to manage and share personal photos using tags .....
- 6) to buy and sell personal items in online auctions .....
- 7) to download music and movies, sometimes illegally .....

**2. Read the article again and match the sentence beginnings (1 - 5) with the correct endings (a - e).**

- |   |   |
|---|---|
| [.....] 1) A weblog , or blog, is an electronic journal | a) web pages on a particular subject.                                 |
| [.....] 2) A peer-to-peer system allows                 | b) for downloading files over the Internet.                           |
| [.....] 3) You can use a search engine to find          | c) users to share files on their computers.                           |
| [.....] 4) BitTorrent is a peer-to-peer protocol used   | d) about fresh, new content on your favorite websites.                |
| [.....] 5) RSS keeps you constantly informed            | e) that displays in chronological the postings of one or more people. |

**3. Find words in the article with the following meanings.**

- 1) open-source, editable web pages .....
- 2) the same as electronic retailer, or online store .....
- 3) a blog that includes video .....
- 4) a program that allows you to make voice/ video calls from a computer .....
- 5) an audio broadcast distributed over the Internet .....

**4. Complete the statements with words from the box**

<b>browse</b>	<b>fake</b>	<b>steal</b>	<b>login</b>
<b>shopping cart</b>	<b>authorization</b>	<b>internet auction</b>	

- 1) Occasionally I buy things on..... sites such as eBay, where people offer and sell things to the highest bidder.
- 2) First you enter a site dedicated to e-commerce and ..... their products.
- 3) Then you put the items you want to buy into a virtual ..... - a program that lets you select the products and buy with a credit card.
- 4) You may have to ..... with a username and a password.
- 5) For some transactions, you will be required to use a TAN, a transaction ..... number.
- 6) Be aware of *phishing* - you may receive..... emails claiming to be from your bank and asking for personal information or account details in an attempt to..... your identity.

5. Look at the HELP BOX and then match the words on the left (1 - 6) with the words on the right (a - f) to make collocations.

- |                     |                 |
|---------------------|-----------------|
| [.....] 1) online   | a) attachments  |
| [.....] 2) take     | b) photos       |
| [.....] 3) email    | c) actions      |
| [.....] 4) upload   | d) website      |
| [.....] 5) portable | e) encyclopedia |
| [.....] 6) official | f) gadget       |

### HELP BOX

A collocation is a pair or group of words that are often used together. For example, we say *make phone calls*, not *do phone calls*.

Here are some common types of collocation:

- verb + noun

**Ex:** *surf the Web*                      *download music*

- verb + particle

**Ex:** *hack into* a computer                      *log onto* a bank account

- adverb + adjective

**Ex:** *highly sensitive* information                      *freely available* on the Web

- adjective + noun

**Ex:** *mathematical formulas*                      *up-to-date information*

The word “**online**” often collocates with other words and can function as adjective or adverb.

**Adjective:** They post opinions on *online* journals.

**Adverb:** A podcast is an audio recording posted *online*.

# **Language Practice**

# Unit 1: Comparison

## A. Introduction

### 1. Comparison of equality

A change is as good as a rest.

*Liverpool isn't as big as London.*

### 2. Comparison of inequality

London is bigger than Liverpool.

Reading is more interesting than watching TV.

### 3. Proportional Comparison

The more you live, the more you learn.

### 4. Coordinated Comparison

The rich are becoming richer and richer.

### 5. Implicit Comparison

Her novel was so interesting that I read it twice.

She wrote such an interesting novel that I read it twice.

The problem was too complex (for me) to solve.

*The problem wasn't simple enough (for me) to solve.*

*The problem was so complex that I couldn't solve it.*

## 1. Comparison of equality

Formed by as + adjective + as

Liverpool is as lively as London.

By negating a comparison of equality, we make a comparison of inequality

*Liverpool isn't as big as London.*

→ London is bigger than Liverpool.

## 2a. Comparison of inequality: Adjectives

Adjectives are converted into comparatives and superlatives by

a) adding the endings -er and -est to the base form

big	bigger	the biggest
great	greater	the greatest



fast      faster      the fastest

b) using the words more and most (periphrastic comparison)

interesting    more interesting    the most interesting  
helpful      more helpful      the most helpful

- Adjectives of one syllable take inflections: She was taller than me.
- Adjectives derived from verbs require periphrasis: I was more bored than you.
- Adjectives of three or more syllables require periphrasis: She was more courageous than me.
- Most two syllable adjectives make periphrastic comparison: She was more helpful than I was.

**However, there are exceptions:**

- Adjectives ending in -er  
She was **cleverer** than I was.
- Adjectives ending in -y  
*It's* **easier** than it seems.
- Adjectives ending in -ow  
The road was **narrower** than it is now.
- Adjectives ending in -le:  
The problem is **simpler** than it seems.
- There are also irregular forms like:

good      better      the best  
bad      worse      the worst

Finally, remember that **the second element** of the comparison is introduced by **than** and that comparative and superlative contexts require words from the **any-series** and other non-assertive expressions:

Friendship is more important than anything.  
She knows more than anyone.  
I feel better than ever.

## **2b. Comparison of inequality: Adverbs**

From the point of view of comparison there are two kinds of adverbs:

- **Regular Adverbs** (formed by adding -ly to the adjective) make periphrastic comparison:

quickly	more quickly	the most quickly
economically	more economically	the most economically

- **Irregular adverbs** (that have the same form as the adjective) make inflectional comparison:

fast	faster	the fastest
early	earlier	the earliest
late	later	the latest
hard	harder	the hardest

- There are also **purely irregular** adverbs like:

well	better	the best
bad	worse	the worst

Finally be careful in exercises because you may have to rewrite sentences with adverbs while the original sentence uses an adjective and vice versa:

Ali drives more quickly than me.  
I am a slower driver than Ali.

Ann is a quicker worker than me.  
*I don't work as quickly as Ann.*

### 3 & 4. Proportional and Coordinated Comparison

There is a correlative comparative structure using the to indicate a proportional relationship between two states or actions:

If you work a lot, you get tired.  
→ The more you work, the more tired you get.

We can use repetition of a comparative form with the word and to indicate progressive change:

Pollution is increasing.  
→ There is more and more pollution.

### 5. Implicit Comparison

There are several types of implicit comparison.

- **So, such**  
The words so and such are used with adjectives and adverbs to express sufficiency or excess, they introduce a that-clause indicating result:

I was so tired that I went straight to bed.

It was such an interesting article that I read it twice.

We use the word **so** with adverbs and with adjectives without a noun, we use **such** with a sequence of adjective + noun. If the noun is count singular, we use the indefinite article:

The juice was so nice that I shared it.  
It was such nice juice that I shared it.

He wrote such silly books that nobody read them.  
He wrote such a silly book that nobody read it.

The only exceptions to the previous rule are the mutal adjectives, which always take so:

He watched so much TV that he became an idiot.

There were so many problems that we decided to have a cup of tea.

We have so little time that we must start now.

There are so few good movies that I rarely go to the cinema.

- **Too**

The adverb **too** indicates excess, it can be followed by an infinitive and the semantic subject of the infinitive can be introduced by **for**:

The package was too heavy for me to carry.

The adverb **too** must be used with adjectives and adverbs. The expressions **too much** and **too many** are used with non-count and plural nouns respectively:

It was too expensive for me to buy.  
It cost too much money for me to buy.  
There were too many problems for me to solve.

- **Too much**

The expression **too much** may be used with verbs with ellipsis of the noun:

It cost too much.  
He works too  
much.  
They worry too much.

- **Enough**

The word **enough** indicates sufficiency, it can be followed by an infinitive and the semantic subject of the infinitive can be introduced by **for**. The word **enough** is placed **before nouns and after adjectives**:

**enough + noun**  
**adjective + enough**

*I haven't enough money to buy it.*

*I'm not rich enough to buy it.*

*It's not cheap enough for me to buy.*

## **B. Practice**

### **1. Fill in the gaps with the appropriate form of the adjective(s) given in parenthesis.**

1. PCs are becoming ..... (small) and..... (powerful).
2. We came at ..... (bad) possible moment.
3. The problem was..... (easy) than it seemed.
4. In Europe people are becoming..... (fat) and..... (fat).
5. The program has a steep learning curve and the manual is .....(obscure) than most.
6. Both algorithms work, but Ann's is a lot ..... (simple) and will use..... (little) memory.
7. It's ..... (fascinating) novel that I have read in ages.
8. We need to go ..... (far) into the problem.
9. The profits were .....(great) than we had expected.
10. The ..... (obvious) solution is not always the .....(good).

### **2. Fill in the correct form of the word in brackets.**

1. The company will have to get its goods to the customers ..... (quick) than at present if it wants to be competitive.
2. We'll have to get up ..... (early) than usual tomorrow.
3. There must be a way of solving the problem.....(economic) than this.
4. A laser printer prints a lot..... (fast) than a dot matrix printer.
5. The post sales service is now supplied ..... (flexible) than in the past.
6. We'll have to work .....(hard) if we want to finish according to schedule.

### **3. Rewrite the sentences with the new beginnings.**

1. The new machine is faster than the others.  
The other machines .....
2. Nowadays memory isn't as expensive as it used to be.

Memory used to be .....

3. Ann works better than John.

John doesn't work .....

4. The problem is simpler than it seems.

The problem isn't .....

5. They don't work as carefully as us.

We are .....

6. Planes are quicker than trains.

Trains don't .....

**4. Use a comparative structure together with the verbs "become" or "get" (no verb is necessary in numbers 1. and 3. to rewrite the sentences). You should use the adjectives below.**

few                      good                      long                      many                      small

1. The number of unemployed is increasing.

There are .....

2. The situation is improving.

The situation .....

3. The number of Windows users is slowly falling.

There are .....

4. The size of integrated circuits is decreasing.

Integrated circuits .....

5. The design process for electronic goods is lengthening.

The design process .....

**5. Fill in the correct form of a suitable adjective.**

1. the PC, the more portable it is.

2. The more whisky you drink,.....you feel.

3. the integrated circuit, the faster it works.

4. you study, the better.

5. the user interface is, the better.

**6. Rewrite the sentences with the new beginnings.**

1. His novel was so successful that it was translated into seven languages.

He wrote .....

2. He's too poor to buy a car.

He hasn't .....

3. There is a shortage of computing engineers.

There aren't.....

4. He is overworking.

He is working .....

5. His house is so small that he can't invite guests.

He has .....

6. The difficulty of the question prevented us from answering.

The question was .....

7. The number of students per group is excessive.

There are .....

8. He is such a silly person that he believes everything I say.

That person is .....

9. He is too young to drive.

He isn't .....

10. The noise was excessive.

There was .....

## Unit 2: The Tense System

### A. Present Time

#### TENSES REFERRING TO PRESENT TIME

##### **Present Simple → ILLIMITED DURATION**

What do you do?  
*I'm a teacher.*

I read a lot of novels.

Unemployment goes up every January.

##### **Present Progressive → LIMITED DURATION**

What are you doing?  
*I'm trying to open this door.*

*I'm reading "The Moonstone".*

Unemployment is going up.

- **PRESENT SIMPLE**

- To talk about permanent situations or about general

facts: They live in a very nice flat.  
Water boils at 100 ° Celsius.

- To talk about things that happen regularly, repeatedly or all the

time: It always rains at the weekend.  
Jeremy is a photographer. He takes photos for a newspaper.

- To describe sequenced actions:

First I take a bowl and break two eggs into it. Next ...

- To refer to future events which are

timetabled: His train arrives at 11.45.  
I start my new job tomorrow.



- In subordinate clauses that refer to the

future: I'll phone you when I get home.  
We'll go to play tennis if it doesn't rain.

- In suggestions with: Why don't you...? and certain expressions

like: How do you do?  
Why don't you take a day off tomorrow?

- With state verbs:

I think you're right.  
She likes her job.  
He wants a new bike.  
I know Jane quite well.

#### **State use of verbs:**

*I think she's right.*  
*I'm thinking about the problem.*

*He's French.*  
*He's being silly.*

She has a new car.  
*She's having lunch.*

#### • **PRESENT PROGRESSIVE → LIMITED DURATION**

- To talk about actions happening now:

*I'm speaking.*

- To talk about actions happening about now with limited duration:

*I'm reading "War and Peace".*

- To talk about changes in progress:

Unemployment is going up.  
The climate is getting warmer.

- For repeated actions with always and similar words: constantly, forever to mean very often or too often:

I'm always losing my keys.

- To talk about a pre-planned future:

*We're having a party on Friday.*

### **TENSES REFERRING TO FUTURE TIME**

- We use the **Present Simple** in **subordinate clauses of time and condition** to make future reference:

*When I get home, I'll have a drink.*

- **Modal adjectives and future time: upgrading**

It is probable that he will succeed.

It is likely that he will succeed.

→ **He is likely to succeed.**

It is improbable that he will succeed.

It is unlikely that he will succeed.

→ **He is unlikely to succeed.**

It is certain that he will succeed.

It is sure that he will succeed.

→ **He is certain to succeed.**

→ **He is sure to succeed.**

→ **He is bound to succeed.**

## **B. Practice: Tenses referring to Present Time**

### **1. Fill in the blanks with the correct present or future form of the verb in parenthesis.**

1. I ..... (not think) that you ..... (tell) the truth about this point.
2. (the machine go down often)?
3. She ..... (arrive) tomorrow.
4. We ..... (start) classes a little earlier this week.
5. We ..... (be) able to rest when we ..... (get) to the hotel.
6. The price of PCs ..... (come) down very quickly.
7. .... (you understand) what ..... (happen)?
8. What ..... (you think) about?
9. Now we all ..... (know) that the figures were not accurate.
10. The company ..... (pay) its employees very low salaries.
11. They ..... (not pay) attention, because the T.V. is on.
12. Who ..... (have) any information about the problem?
13. She ..... (always try) her best.
14. John ..... (weigh) more than 90 kilos.
15. As soon as I ..... (finish) this silly job, I ..... (give) you a ring.
16. Where ..... (you go)? The cinema is at the other end of the street.
17. (you think) the plan will work?
18. The technician ..... (now weigh) the samples.

### **2. Rewrite the sentences with the new beginnings.**

1. There is a steady rise in the number of unemployed.

Unemployment .....

2. Sam will definitely forget about the meeting.

Sam is .....

3. He isn't in the habit of making backups.

He doesn't .....

4. They will probably be out together, dancing cheek to cheek.

They are .....

5. We have arranged to meet next Friday.

We are .....

6. He probably won't agree to the plan.

He is .....

7. It's certain that the train will be delayed.

The train .....

8. It's probable that she will overcome the problem.

She is .....

9. There will certainly be difficulties.

There are .....

10. The strike will definitely be massively supported.

The strike is .....

## C. Past Time

**Past tense** → past time exclusive of the present

**Present Perfect tense** → past time inclusive of the present

<u>Past tense</u>	<u>Perfect tense</u>
<p>I saw her <b>yesterday</b>.</p> <p><i>I didn't see her last week.</i></p> <p>I saw her <b>a few minutes ago</b>.</p> <p><b>When</b> did you arrive?</p> <p>What did you say? (<b>before I started speaking</b>)</p>	<p>I have seen her <b>today</b>.</p> <p><i>I haven't seen her this week.</i></p>

- **The PAST SIMPLE tense may refer to a punctual action or to a period of time:**

I left my job last week.

As a child, he lived in Africa.

- **PRESENT PERFECT: ways of including the present**

- **Adverbs**

*I haven't seen the film yet.* I have just spoken to her.

(**have just** → a recent past:  
I spoke to her a few minutes ago  
→ I have **just spoken to her.**)

- **Present consequences**

*He can't come to the party because he has broken his leg.*  
**BUT**  
*He can't come to the party because he broke his leg **yesterday.***

- **Reference to an indefinite past that includes the present**

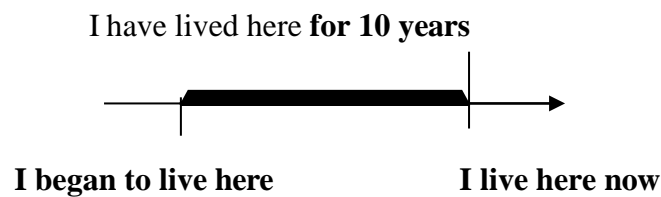
*Have you ever seen "Hamlet"?*

I have never flown in a balloon.

It's the first time I have flown in a balloon.

- **Duration from the past into the present**

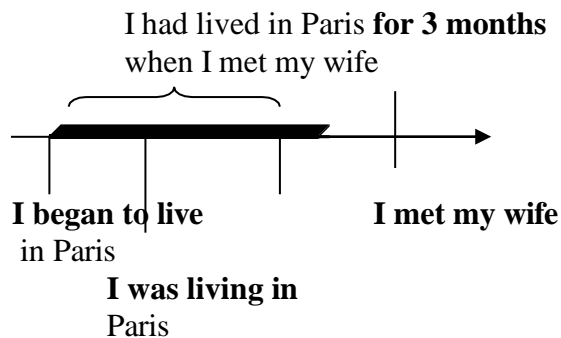
I have lived here for 10 years.



- **PAST PERFECT**

- **Duration from a more remote to a more recent past**

I had lived in Paris for three months when I met my wife.



- **FUTURE PERFECT**

- **Duration from the past or present into the future**

By 2005 I will have worked here for 15 years.

By 2005 I will have worked here  
**for 15 years**



I began to work  
here in 1990

I will be working  
here in 2005

- **PRESENT PERFECT: ways of including the present**

- **Duration from the past into the present**

I began to live here in 1990.

I have lived here for x years/since 2000.

I have lived here since I got out of prison.

**FOR → PERIOD OF  
TIME SINCE → POINT IN  
TIME**

I moved here in 1990.

I have lived here for 9 years.

I met her in 1990.

I have known her for 9 years.

We met in 1990.

We have known each other for 9 years.

## D. Practice: Tenses referring to Past Time

### 1. Fill in the blanks with the correct tense referring to past time of the verb in brackets.

1. Ann.....(arrive) a few minutes ago.
2. I..... (not see) such a good film for ages.
3. I..... (have) lunch when I..... (hear) the news on the radio.
  
4. I..... (not reread) his first novel since it..... (come out).
5. When Ann..... (finally get) to the airport, we..... (wait) for two hours.
6. It's the first time I..... (travel) by balloon.
7. When the explosion..... (occur) we simply..... (not understand) what..... (happen).
- 8.(the postman come) yet?
9. I..... (phone) for the last ten minutes and I..... (still not manage) to get through.
10. They say that the work on the tunnel.....(begin) by the end of next year.
11. I..... (fall) asleep when the telephone..... (ring).
  
12. It was the worst accident that I..... (ever see).
13. We..... (just finish) lunch. Would you like a coffee?
14. The meeting..... (go on) for some time when we.....(finally arrive).

### 2. Compare the following pairs of sentences and work out the different implications of each pair.

1. a. He has lived in Spain for two years.  
b. He lived in Spain for two years.
2. a. I have smoked since I left school.  
b. I smoked for six months.
3. a. I didn't see Tom this afternoon.  
b. I haven't seen Tom this afternoon.



**3. Finish the second sentence without changing the meaning.**

1. He started studying English eighty years ago.

He has .....

2. Is this your first visit to London?

Have you .....

3. He hasn't written to his parents for two months.

The last time .....

4. I moved to Valencia in 2002 (at 13:58).

I have.....

5. I met Wendy in 2005.

I have .....

**4. Use a present tense, the Simple Past or the Present Perfect to fill in the blanks.**

1. (visit) the Uffizi when you were in Florence?

2. (you ever visit) the Uffizi?

3. I'm ashamed to say I ..... (never read) the Divine Comedy.

3. When.....(you get) here?

4. I..... (live) in Valencia for ten years now.

5. I can't help you just now, I..... (try) to finish this exercise.

6. I ..... (know) Ann since we..... (be) children.

7. I'm a bit nervous, because this is the first time I.....(speak) in public.

8. I am really exhausted, I.....(work) too much.

9. Just a second, I ..... (not finish) this exercise yet.

10. Paul.....(call) a few minutes ago to say that he'd be late.

11. The sun ..... (get) colder and colder.

12. I ..... (not read) such a good novel for ages.

13. He's not here, I'm afraid. He ..... (just pop) out.

**5. In the following exercise you must decide whether the sentences are right (R) or wrong (W). If they are wrong you must correct them.**

1. Mary comes for a drink this evening.
2. Phone me when you'll have time.
3. I go to the beach about twice a year.
4. I know her since 1992.
5. What does he do?
6. He often plays computer games with his PC.
7. When I arrived at the party, she has already gone home.
8. I'm feeling OK.
9. I'm living in Valencia since 1980.
10. Have you had good weather last weekend?
11. I can't go on holiday because I broke my leg.
12. It's raining since Easter.

**6. Make sentences using the present perfect with FOR or SINCE according to the sentences and words given. Use positive or negative forms as indicated. (Remember that FOR is used for a period of time and SINCE for a point of time in the past with reference to the present).**

1. I stopped smoking tobacco eight years ago. (smoke/negative)  
.....
2. He gave up alcohol after his car accident. (drink/negative)  
.....
3. We started running two kilometres every morning in 1990. (run/positive)  
.....
4. I play squash every Friday night. This began when the squash court opened.  
(play/positive)  
.....
5. My brother began to be interested in folk music five years ago. (be/positive)  
.....

## Unit 3: Prepositions

### A. Introduction

#### 1. The basic prepositions of LOCATION and MOVEMENT

It is important to understand the basic uses of the three prepositions at, on and in to refer to location. These uses depend on the way we view the dimensionality of the location and are summarized in Table 1:

Table 1.

PREPOSITION	DIMENSION	EXAMPLE
AT	0	at the door
		at Grunge Studios
		at the station
ON	1	on a line
	2	on the floor
IN	2 (enclosed)	in the garden
	3	in the box

It is useful to subdivide the uses of each of these basic prepositions, for example there are different reasons for considering a location as having no dimensions. These are summarized in Table 2.

Table 2.

TYPE OF 0-DIMENSIONS	EXAMPLES
DIMENSIONALITY IS INAPPROPRIATE	at the bus-stop
	at the door
DIMENSIONALTY IS UNSPECIFIED	at the station
	at the airport
DIMENSIONALITY IS UNIMPORTANT	at Grunge Studios
	at his/her office

The different uses of on can also be classified. Notice that, we use on to refer to means of public transport, except taxis, when they are used for their typical purposes:

I met him on the train.

There were 39 passengers trapped in the train.

The basic uses of on are shown in Table 3:

Table 3.

USE	EXAMPLES
1-dimension	on my way to work
	on the coast
	on the river Cam
2-dimensions normal	on the table
	on the floor
	on the shelf
2-dimensions object	on the disk
	on the record
	on the screen
public transport	on the bus
	on the plane
	on the train

Finally the basic uses of in are shown in Table 4:

Table 4.

2-dimensions (enclosed)	in the garden
	in a field
	in the mirror
3-dimensions	in the drawer
	in the house
	in London
	in the South of England
	in Cuba

These three basic prepositions of place are associated with prepositions and adverbs indicating positive and negative movement as shown in Table 5. The prepositions are usually formed by the adverb and the word enclosed in square brackets:

He walked away vs. He walked away from the bus stop.

The prepositions into and onto are sometimes reduced to in and

on: He put the money in(to) his pocket.

They got on(to) the bus.

Table 5.

PLACE PREP.	+ MOVEMENT	- MOVEMENT
AT	TO	AWAY [FROM]
ON	ON([TO])	OFF
IN	IN([TO])	OUT [OF]

## 2. The basic prepositions of TIME

**AT:** "at" is basically used to introduce points of time, mainly clock time, in the expressions at night, at the weekend and with public holidays:

We'll meet at half past six then.

I was woken up at midnight by an explosion.

There's nothing interesting going on at the moment.

I always sleep in at the weekend.

I won't be here at Easter.

I often work at night.

**ON:** the preposition "on" is basically used for days and dates:

I'll see you on Saturday.

The meeting's on the first of July.

We also use "on" if we mention the day and the part of the day:

I'll be seeing her on Friday evening.

We're going shopping on Saturday afternoon.

We're going out on Friday night.

**IN:** "in" is used with parts of the day and with periods longer than a day:

I'll do that in the morning.

We could go for a walk in the afternoon.

We'll be off in August.

It was fashionable in the (early/mid-/late) sixties.

He must be in his (early/mid-/late) twenties.

Ø: It is obligatory to omit the preposition before deictic time words, last, next, this:

I'll be seeing him next Saturday.  
We're having a party this weekend.  
I was in London last week.  
We didn't go on holiday that year.

### 3. Other prepositions

The following notes review the basic uses of the above prepositions and explain the most important uses of other prepositions that you should know:

#### 1. IN

- a) 3-dimensions  
in the house; in a box; in a city; in a region; in a country.
- b) 2-dimensions  
in the field; in the garden; in the mirror; in the window.
- c) time  
in the morning; in the afternoon; in the evening<sup>1</sup>; in the first week of January; in the Christmas holidays; in winter; in 1996; in the next century.
- d) + attributes (clothes)  
the man in the blue suit.

#### 2. ON

- a) 2-dimensions  
on the floor; on the table; on the disk; on a track; on a mountain; on the screen;  
on a record; on the wall; on the ceiling; on top of.
- b) 1-dimension  
on a line; on the coast; on the border; on the frontier; on the way (to)<sup>2</sup>; on a route; on a bicycle; on a motorbike.
- c) + means of public transport  
on a bus; on a train; on a plane; on a ship<sup>3</sup>.
- d) time  
on the first of June; on Monday; on Monday morning.
- e) dependency  
We rely/depend on her.

#### 3. AT

- a) 0-dimensions  
at the bus-stop; at the door; at the airport; at a party; at a meeting; at the beginning/the end of.
- b) time  
at the moment; at this minute; at this instant; at a time; at ten past seven; at Christmas; at Easter.
- c) intended target  
It is aimed at beginners; He pointed the gun at me.

#### 4. INTO

- a) 3-dimensional destination  
He ran in([to] the house); They drove in([to] the country).
- b) 2-dimensional destination  
He went in([to] the field).
- c) change  
A compiler translates/transforms/converts/changes high level language into machine code.

#### 5. OUT OF

- a) 3-dimensional negative movement  
He ran out (of the house).

---

<sup>1</sup>Notice the exception "at night".

<sup>2</sup>Remember that when "way" indicates "manner" we must use the preposition "in".

<sup>3</sup>But "in a taxi".

- b) 2-dimensional negative movement  
He walked out (of the garden).
- c) lack  
He is out of work/luck; we ran out of paper/memory.
- d) statistics  
Seven out of ten people agree with the idea.
- e) position (abstract)  
The variable is out of range.
- f) origin  
It is made out of metal; A new technique emerged out of his pioneering work.

#### 6. ON(TO)

- a) two-dimensional destination  
He climbed on([to] the roof).
- b) + means of public transport  
He got on([to] the bus/train/plane etc).
- c) adverb → (+) power  
He switched/turned the machine on.

#### 7. OFF

- a) 2-dimensional negative movement  
It fell off the table.
- b) + means of public transport  
He got off the bus/plane train etc.
- c) adverb → (-) power  
He switched/turned the machine off.

#### 8. TO

- a) general destination

- Go to the bus-stop/the cinema; got to London/France
- b) indicating limit (with "up" + "down")  
Salaries fell down to half their previous value; It prints at up to 2,000 lines per minute.
  - c) to introduce the **indirect**  
object I gave it to John.

### 9. AWAY FROM

negative movement

He walked away (from the bus-stop); They drove away (from the house).

### 10. ABOUT

a) approximately

There were about fifty people at the meeting.

b) subject matter

He wrote a book about the infinitive; He spoke to me about the subject.

### 11. ABOVE/BELOW

a) difference in level (position)

They stood above the hole in the ground; Below the village there was a valley.

b) difference in level on a scale

2°C below zero; above average; 5% above the legal rate.

c) textual

as we can see in the diagram below; as I explained above.

### 12. ACROSS/ALONG

a) across → movement from one side to another

He walked across the street; He walked across the field.

b) along → movement from one end to another

He walked along the street; He walked along the path.

### 13. AFTER

a) time

They arrived after 3 o'clock; after finishing work, I had a drink.

b) position

It is the third house after the post-office.

c) movement (pursuit)

He ran after the  
thief.

### 14. AGAINST

a) position

He was leaning against a tree.

b) abstract

He was against the idea; He advised us against going to the police; There is evidence against that theory.

### 15. AROUND

a) movement

He walked around the corner/the room/the city.

b) approximately



There were around fifty people at the meeting.

**16. BEHIND ≠ IN FRONT OF**

position

He stood behind/in front of the car.

**17. BESIDE/BY/NEXT TO/NEAR**

position

They asked for a table beside/by/near/next to the window.

**18. BY**

a) to introduce the agent of the  
passive The book was written by  
Mr. Smith.

b) used with the gerund to indicate method  
He found the information by consulting an encyclopaedia.

**19. BY MEANS OF**

means

The user can communicate with the computer by means of the operating system.

**20. FOR**

a) intended destination  
They left for Paris; they made for home.

b) standard  
It prints very slowly for a laser printer.

**21. FROM**

origin

He stole/got/took/borrowed the money from the bank.

**22. OPPOSITE**

position

he sat opposite us; the hotel is opposite the airport.

**23. OVER ≠ UNDER**

a) position

There was a light over the table; There was a carpet under the table.

b) movement

The plane flew over the city; He slipped the note under the door.

c) with numbers → more/less than

There are over three million people out of work; tickets are half price for children under 16.

d) all over (pervasive meaning)

There were papers all over the floor; There were rumours all over the country.

**24. PAST**

movement

He walked past the shop; He drove past the building.

**25. THROUGH**

a) movement

He walked through the tunnel; The rain came in through a hole in the roof.

b) method

They got into contact through a network.

**26. UP ≠ DOWN**

movement

He went up/down the stairs; He moved the cursor up/down the screen.

**27. VIA**

method

The program was transmitted via satellite.

## B. Practice

**1. In the following exercise you must fill in the blanks using one of the prepositions at, on or in. In some cases more than one answer will be possible.**

1. We arrived late and everybody was already sitting .....the table.
2. There was an enormous poster .....the wall.
3. You should turn left ..... the traffic light.
4. As it was raining, we decided to shelter ..... the post office.
5. The explosion caused an enormous hole .....the wall.
6. They live ..... the north of Spain..... the border with France.
7. After the elections thousands of people gathered..... the town hall.
8. He tried to hide the money .....his pocket.
9. There was a picture of the author ..... the front cover of the book.
10. A lot of students were sitting..... the stairs.

**2. In the following exercise you should use a preposition or adverb of movement to fill in the blanks.**

1. As I was driving.....the car park, I realized that the briefcase had been stolen.
2. Take all those newspapers.....the shelf.
3. When it started to rain we all ran..... the house.
4. We all ran..... the policemen as they looked angry and had truncheons.
5. After the robbery the robbers drove ..... the bank ..... a blue car.
6. You have to get .....the bus at the third stop.
7. Don't put that glass.....the table, you're going to stain it.
8. I remember putting the wallet back        my pocket.
9. We locked him ..... the room, but he managed to get ..... .
10. The council should come and take all that rubbish ..... .
11. Watch out, he's going to fall.....his bike.

12. I have to get some money ..... the bank.
13. When we got ..... the bus, we realized that it wasn't air-conditioned.
14. I managed to get all the mud ..... my boots.
15. Shall we take the meat ..... the oven? It must be done by now.
16. I knocked the gun ..... his hand.
17. He fell as he was getting ..... the train and broke his ankle.
18. Get ..... this house, I'm fed up with you.

**3. Fill in the blanks with "at", "on", "in" or "ø":**

1. I'll see you ..... Saturday.
2. I've got a lot of work ..... this August.
3. Let's meet ..... half six.
4. I usually have a light meal ..... the evening.
5. The company was founded ..... the 19th century.
6. I've got a lot of problems ..... the moment.
7. We're having a party ..... next Saturday.
8. I like to work ..... night.
9. The meeting's ..... April the first.
10. It was a popular group ..... the eighties.
11. They usually go on holiday ..... August.
12. I'll get a couple of weeks off ..... Christmas.
13. I remember that we went to France for our holidays that year.
14. We can finish it ..... the morning.
15. See you ..... Monday.
16. I'd say he was ..... his late teens.
17. I'll be going to England ..... this Christmas.
18. She always does a lot of work ..... the weekend.

**4. Fill in the blanks with an appropriate preposition.**

1. He got ..... his car and walked.....the bank.
2. He drank the beer straight ..... the bottle.
3. They walked ..... the forest.
4. We have arranged to meet.....Sunday afternoon.
5. Unfortunately we seem to have run .....memory.
6. I met an old friend.....the train to London.
7. You must know the building, you drive ..... it every day ..... your way to work.
8. He fell ..... the bridge .....the river.
9. We managed to jump ..... the fence.
10. You should back up important files..... on pen drives.
11. He lives.....the south of France.
12. He can't drive a car because he's..... 16.
13. There's a man standing.....the roof of the house.
14. He lives ..... a city ..... the coast.
15. He looked very silly ..... such a big coat.

**5. Fill in the gaps with an appropriate preposition.**

1. It is possible to insert machine code .....your programs.
2. His marks in exams were definitely ..... average.
3. We could pay .....£2,000, but no more and we would certainly prefer to pay less.
4. Two ..... every three people interviewed were worried about the prospect of losing their job.
5. You'll have to drive ..... the bridge and ask for information.....the petrol station.
6. The affair grew ..... a national scandal.
7. The police are looking for him, so he'll probably try to get..... the country.
8. It is said to be dangerous to spend too long .....the monitor.
9. We walked.....the city centre.
10. The machine is rather heavy..... a laptop.
11. The situation is very bad in the region and unemployment is well .....the national level.
12. We all ran ..... the policemen.
13. There was a big box ..... the floor, but he couldn't see what was..... it.
14. She is exceptionally good..... a beginner.
15. There was an enormous hole .....the wall.

**6. Rewrite the sentences with the new beginnings.**

1. We entered the building.  
  
We went .....
2. They left the office in a hurry.  
  
They hurried .....
3. The passengers boarded the train.  
  
The passengers got .....

4. All the passengers left the bus.

All the passengers got .....

5. Ann lent me the money.

I borrowed the money .....

6. Sales reached one million.

Sales went .....

7. Hackers managed to penetrate the network.

Hackers managed to get .....

8. He removed the furniture that was in the room.

He took the furniture .....

9. She used plastic to make the device.

She made the device .....

10. She inserted the disk.

She put the disk..... the disk drive.

11. He dismantled.

He got ..... his bicycle.

12. There are more than 3,000 languages in the world.

There are .....

## **Glossary of Technical Terms**



## Reading 1. Psychology and Computing

**artificial intelligence:** intelligence shown by an artificial entity or refers to systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect (الذكاء الاصطناعي).

**bottom-up** (adj.): in a bottom-up model parts of a problem are analyzed in detail (تصاعدي).

**frame:** a cognitive framework within which information is processed (الإطار).

**massively parallel processing:** an architecture in which each processing element (P.E.) has its own memory and copy of the operating system and each P.E. must communicate with the others (معالجة متوازية على نطاق واسع).

**neural networks:** a group of interconnected artificial neurons used for information processing (الشبكات العصبية).

**parallel computing:** a general term that covers different architectures that solve problems by using multiple computers or computers made up of multiple processors (الحوسبة المتوازية).

**script:** a cognitive framework within which information is processed (البرنامج النصي).

**top-down** (adj.): in a top-down model a general overview of a problem is formed without paying attention to details. Each part of the problem is then refined in more and more detail (تنازلي).

## Reading 2. Computer Essentials

**Hardware:** The physical components of a computer including things like monitors, keyboards, mice, and printers (مكونات مادية).

**Software:** Software is a set of instructions, data or programs used to operate computers and execute specific tasks (برمجيات).

## Reading 3. New Input Technologies

**artificial intelligence:** the ability of a computer system to perform tasks that seem to require intelligence.

**flat panel display:** a thin computer screen (شاشة مسطحة).

**fuzzy logic:** a system of logic which allows multiple truth values (منطق غامض أو غير واضح).

**handwriting recognition program:** a program that is able to recognize handwritten instructions or data (برنامج التعرف على خط اليد).

**highlight** (v.): to identify an area of the screen in order to perform some operation (تسليط الضوء).

**input:** data fed into the computer.

**input device:** a peripheral that provides input for the computer (جهاز الإدخال).

**LCD: (Liquid Crystal Display)** a display technology used in digital watches and portable computers (شاشات الكريستال السائل).

**keyboard:** a set of input keys (لوحة مفاتيح).

**onscreen keyboard:** a keyboard represented on the screen of the computer (لوحة مفاتيح على الشاشة).

**mouse:** a hand-held pointing device.

**natural language processing:** the understanding of human languages (معالجة اللغات الطبيعية).

**neural network:** a computer system that imitates the way the human brain works.

**pen-based computing:** the use of a pen or stylus to input data to the computer (الحوسبة القائمة على القلم).

**speaker dependent** (adj.): capable of learning to recognize the speech of a specific individual (يعتمد على المتحدث).

**speaker independent** (adj.): capable of recognizing anyone's speech (متحدث مستقل).

**speech-to-text conversion:** the automatic conversion of speech into text (تحويل الكلام لنص).

**speech recognition:** the ability to understand spoken input (التعرف على الكلام).

**vertical worker:** someone who works outside (عامل خارجي).

#### Reading 4. Colour Printing

**additive colour:** the colours emitted by a light source (اللون المضاف).

**colour management:** the control of colour produced by different peripherals (إدارة الألوان).

**dither** (v.): to create additional colours or hues from a basic palette (مزج).

**dot:** a small space that constitutes one element of a matrix used to display or print a character or image (نقطة).

**dot matrix:** a pattern of small dots that make up a printed or displayed image or character (تشكيل نقطي).

**gamut:** the range of colours that a device is capable of producing (مجال اللون).

**grey level:** a level on the grey scale of a device between white and black (المستوى الرمادي).

**pixel:** (Picture Element) the smallest area of screen whose light can be varied; (بكسل ، عنصر الصورة).

**resolution:** a measure of the sharpness of a displayed or printed image (الدقة).

**subtractive colour:** a colour reflected by an object. The subtractive colors are **cyan, yellow, magenta and black**, also known as CMYK (لون مطروح).

**thermal transfer printer:** a printer that uses heating elements to melt dots of pigment onto paper (طابعة نقل حراري).

**toner:** electrically charged ink used in laser printers (الحبر).

**toner cartridge:** is a cartridge that holds physical print medium materials for a modern laser printer (خرطوشة الحبر).

## Reading 5. Mechanical Athletes Totter Towards Olympic Glory

**bank of rules** [in artificial intelligence] a store of rules that is kept ready for use when needed (بنك القواعد).

**Connection:** the joint where two wires are joined together (اتصال).

**engineer** (v.): to develop something following scientific principles and methods (ينشئ).

**mechanical** (adj.): a mechanical device has moving elements and uses power to work (ميكانيكي).

**process** (v): to perform operations on data (يعالج).

**reinforce** (v): to make something stronger (يعزز).

**Researcher:** a person who studies a subject (باحث أو محقق).

**Robotics:** the science of devising and designing robots (علم الروبوتات).

**rule-based system:** an expert system based on a bank of rules (نظام قائم على القواعد).

**Scan (v.):** look carefully (يفحص).

**Sensor:** an instrument which reacts to certain physical conditions or impressions (المستشعر).

**store (v):** to keep data in a computer (يخزن).

**Task:** a piece of work that has to be done (مهمة).

**train (v):** teach somebody to do something, also applied to computer programs that need training (يدرب).

**vision system:** the system that allows robots to identify the objects they come across (نظام الرؤية).

**visual information:** data on what the robot has seen (المعلومات البصرية).

## Reading 6. Memory Technologies

**to access (v.):** to gain entry to (يدخل – الوصول).

**access time:** the time taken to retrieve an item of information from storage (زمن الوصول للبيانات أو المعلومات).

**access:** the reading or writing of data, with the connotation that the content of the reading or writing is taken into account (الوصول للبيانات).

**auxiliary memory:** the memory on which information is held for reference but not for direct execution (ذاكرة مساعدة).

**backing memory:** refers to a disk or tape (ذاكرة الأمان / النسخ الاحتياطي).

**cache:** a type of memory that is used in high-performance systems, inserted between the processor and memory proper (ذاكرة التخزين المؤقت).

**circuitry:** a set of circuits (الدوائر).

**computer system:** a combination of hardware and software with a specific purpose (نظام الكمبيوتر).

**input-output program:** a program which manages the flow of information between the computer and the outside world (برنامج تسجيل الدخول/الخروج).

**instruction set:** the totality of instructions that a computer is capable of performing (مجموعة التعليمات).

**internal processor memory:** the processor built-in memory for its internal operations

(ذاكرة المعالج الداخلية).

**location:** refers to a position within the computer memory; the word **address** is actually used as a synonym (الموقع أو العنوان).

**magnetic disk:** a storage medium in the form of a circular plate coated on one or both sides with a magnetic film. Data is recorded in concentric tracks in the film (قرص مغناطيسي).

**main memory:** the storage that is closely associated with the processor of a computer system and from which the program instruction and data can be directly retrieved and to which the resulting data is written prior to transfer to backing store or output device.

**to manage (v.):** to match requests with the appropriate information (يدير).

**memory technologies:** kinds of memory (تقنيات الذاكرة).

**memory unit:** a storage unit of information (وحدة ذاكرة).

**memory system:** a complete storage system (ذاكرة النظام).

**performance:** amount of useful work that can be achieved by a system (أداء).

**peripheral:** any device, including I/O devices and backing store, that is connected to a computer via the input/output subsystem (طرفي).

**primary memory:** another name for **main memory** (ذاكرة الاساسية).

**processor:** device to process information, usually the central processor (معالج).

**processor speed:** the speed at which the processor works (سرعة المعالج).

**read request:** a signal sent through the bus for the memory to be read at the address specified in the address bus (طلب قراءة).

**read access time:** the period between the read request and the availability of the requested data (زمن الدخول للقراءة).

**register:** a group of (usually) bistable devices that are used to store information within a computer system for high-speed access (مسجل).

**secondary storage:** another word for **backing store** (التخزين الثانوي).

**secondary memory:** another word for **backing memory** (الذاكرة الثانوية).

**semiconductor:** a material, such as silicon, whose electrical conductivity increases with temperature and is intermediate between metals and insulators (أشباه الموصلات).

**storage:** a device or medium that can retain data for subsequent retrieval (تخزين).

**storage cell:** another word for **storage unit** (خلية تخزين).

**storage capacity:** the amount of information that can be stored in a specific device (سعة التخزين).

**storage device:** a device that can receive data and retain it for subsequent retrieval (جهاز التخزين).

**storage unit:** a unit that can receive data and retain it for subsequent retrieval (وحدة تخزين).

**tape:** an information storage medium consisting of a magnetic coating on a flexible backing in tape form (شريط تسجيل).

**word:** a vector of bits that is treated as a unit of information by the computer hardware (كلمة).

**write access time:** the elapsed time during which a given amount of data is being recorded in some storage device (زمن الوصول للكتابة).

## Reading 7. Operating Systems

**allocation:** the act of making a resource available to a process (or the amount of a particular resource that has been allocated) (توزيع أو تخصيص).

**allocate (v):** to make a resource available to a process (يخصص).

**allocator:** the operating system acts as a resource allocator as it allocates resources to programs and users (موزع - مخصص).

**blocked (adj.):** a process which is unable to proceed because it lacks some necessary resource (محذورة - ممنوعة).

**compiler:** a program that translates high-level language into machine code (مترجم).

**computer resource management program:** a program which controls the resources of the computer (برنامج إدارة موارد الكمبيوتر).

**concurrent (adj):** simultaneous, in parallel (متزامن).

**CPU time:** the time for which a process has been receiving service from the processor (وقت وحدة المعالجة المركزية).

**disable (v):** to make a device inactive (يعطل).

**environment:** the particular surrounding (البيئة).

**file management routine:** a routine concerned with the overall management of files, e.g. their allocation to space in backing store, writing backup copies, etc. (روتين إدارة الملفات).

**file storage space:** the space left for storing files (مساحة تخزين الملفات).

**firmware:** system software that is held in read-only memory (ROM) (البرامج الثابتة).

**interrupt request:** a request for a temporary interruption (طلب المقاطعة).

**interrupt-handling routine:** a section of code to which control is transferred when a processor is interrupted (روتين التعامل مع المقاطعة).

**invoke (v.):** call (يستدعي - يدعو).

**I/O processor:** a specialized computer that permits autonomous handling of data between I/O devices and a central computer or the central memory of the computer (معالج الإدخال / الإخراج).

**I/O device:** any unit of a system that is the entry and/or exit point for information (أجهزة الإدخال / الإخراج).

**I/O device control programs:** the part of the system software that controls the I/O hardware (برامج التحكم في جهاز الإدخال / الإخراج).

**kernel:** the lowest layer into which a large operating system is subdivided, each layer dealing with some aspect of the system hardware (نواة).

**memory allocation/deallocation request:** the asking for memory allocation or deallocation (طلب تخصيص / إلغاء تخصيص الذاكرة).

**memory space:** the space that is left in memory (مساحة الذاكرة).

**multiuser environment:** a system that is serving more than one user simultaneously (بيئة متعددة المستخدمين).

**operating system:** the set of software products that jointly controls the system resources and the processes using these resources on a computer system (نظام التشغيل).

**performance:** throughput (أداء).

**process:** a stream of activity; a process is defined by its code, i.e. the ordered set of machine instructions and the memory space assigned to the process (عملية).

**processor scheduling routine:** the routine used to determine which of several processes will actually be granted use of the processor (روتين جدولة المعالج).

**programming language translator:** a program that converts a program written in one language to the equivalent program in another language (مترجم لغة البرمجة).

**ready (adj.):** a state in which a process is waiting for the resources it needs to enter the running state (جاهز).

**real-time system:** any system in which the time at which output is produced is significant (نظام الوقت الحقيقي).

**reliability:** the ability of a computer system to perform its required functions for a given period of time (الموثوقية).

**resource:** any of the component parts of a computer system and the facilities that it offers (المورد - المصدر).

**response time:** the elapsed time between a service request by a computer-system user and the receipt of some form of response or feedback from the system (وقت الاستجابة).

**running** (adj.): active; currently being executed ( قيد التشغيل).

**schedule** (v.): control the use of a shared resource (يرتب - ينظم - يدرج في جدول).

**software:** the programs executed by a computer system as distinct from the physical hardware of that computer system (البرمجيات).

**state-switching:** the change of state of the computer processes (تبديل الحالة).

**subroutine:** a piece of code that is obeyed out of line, i.e. control is transferred to the subroutine and, on its completion, control reverts to the instruction following the call (روتين فرعي).

**system resources:** the resources in a computer system (موارد النظام).

**task:** another name for process (مهمة).

**timesharing:** a technique for sharing the time of a computer among several jobs (وقت المشاركة).

**transaction-processing system:** a method of organizing a data processing system in which transactions are processed to completion as they arise (نظام معالجة المعاملات).

**user command:** user instruction or statement (أمر المستخدم).

**utility programs:** the collection of programs that forms part of every computer system and provides a variety of generally useful functions, including file copying and deleting, etc. (البرامج المساعدة).

**virtual memory routine:** a routine in which a process workspace is held partly in high-speed memory and partly on some slower, and cheaper, backing-store device (روتين الذاكرة الافتراضية).

**wide-area network:** a communication network distinguished from a local area network because of its longer-distance communications (شبكة منطقة واسعة).

## Reading 8. Networks

**circuit or line switching:** a method of communications that is used in telephone systems and requires a physical transmission path -a circuit- to exist between the two devices wishing to communicate (تبديل الدوائر أو الخطوط).

**common carrier:** a private business or corporation that offers to the public general communication services (شركة خدمات عامة).



**e-mail:** electronic mail sent between users of computer systems , the computer systems being used to hold and transport messages (بريد الكتروني).

**file:** information held on backing store (ملف).

**keyboard :** an array of keys on a plane that can cause a discrete signal when pressed with a finger (لوحة مفاتيح).

**LAN:** local area network (شبكة المنطقة المحلية).

**message switching:** a data-switching strategy that requires no physical path to exist between sender and receiver before communication can take place (تبديل الرسائل).

**network:** a collection of resources used to establish and switch communication paths between its terminals (شبكة).

**screen:** the surface of a display on which information can be shown (شاشة).

**store-and-forward:** a method in which information is passed from node to node in a communication network, pausing in each node until sufficient resources are available for the next leg of the journey (تخزين وإعادة توجيه).

**terminal:** a data input and/or output device that is connected to a controlling processor to which it is subservant and usually remote (الطرفي).

## Reading 9. Multiprocessors

**distributed memory computer:** a multiprocessing system in which each processor has its own main memory (حاسب الذاكرة الموزعة).

**fault-tolerant (adj.):** able to operate in spite of faults (متحمل للخطأ).

**global memory:** main memory that all processors in a shared-memory computer can access (الذاكرة العالمية).

**graceful degradation:** the ability to operate correctly at a reduced performance level despite faults (تراجع أو تدهور).

**loosely coupled system:** a distributed memory computer (نظام مقترن بشكل فضفاض).

**main memory:** a fast memory that stores programs and data during computer operation and that can be accessed by the CPU instruction set (الذاكرة الرئيسية).

**multicomputer system:** a computer system made up of several autonomous computers (نظام متعدد الحواسيب).

**multiprocessor:** a computer system characterized by the presence of several CPUs (متعدد المعالجات).

**program library:** a collection of functions and procedures that can be invoked by a program (مكتبة البرنامج / مكتبة).

**secondary memory unit:** any peripheral storage device (وحدة ذاكرة ثانوية).

**shared memory computer:** a multiprocessing system in which all processors can access main memory or a large part of main memory (كمبيوتر الذاكرة المشتركة).

**system software:** programs used to control the computer and to run applications programs (برنامج النظام).

**throughput:** the speed at which a computing system can process data (الإنتاجية أو تدفق المعالجة).

**tightly coupled system:** a shared-memory computer (نظام مقترن بإحكام).

**uniprocessor:** a computer system containing a single processor (أحادي المعالج).

### Reading 10. The Web

**Internet:** is a vast network that connects computers all over the world. Through the Internet, people can share information and communicate from anywhere with an Internet connection. الانترنت

**blog:** A blog, short for weblog, is a frequently updated web page used for personal commentary or business content. (مدونة)

**RSS:** stands for Really Simple Syndication. It's an easy way for you to keep up with news and information that's important to you, and helps you avoid the conventional methods of browsing or searching for information on websites. (خلاصات مبسطة حقا)