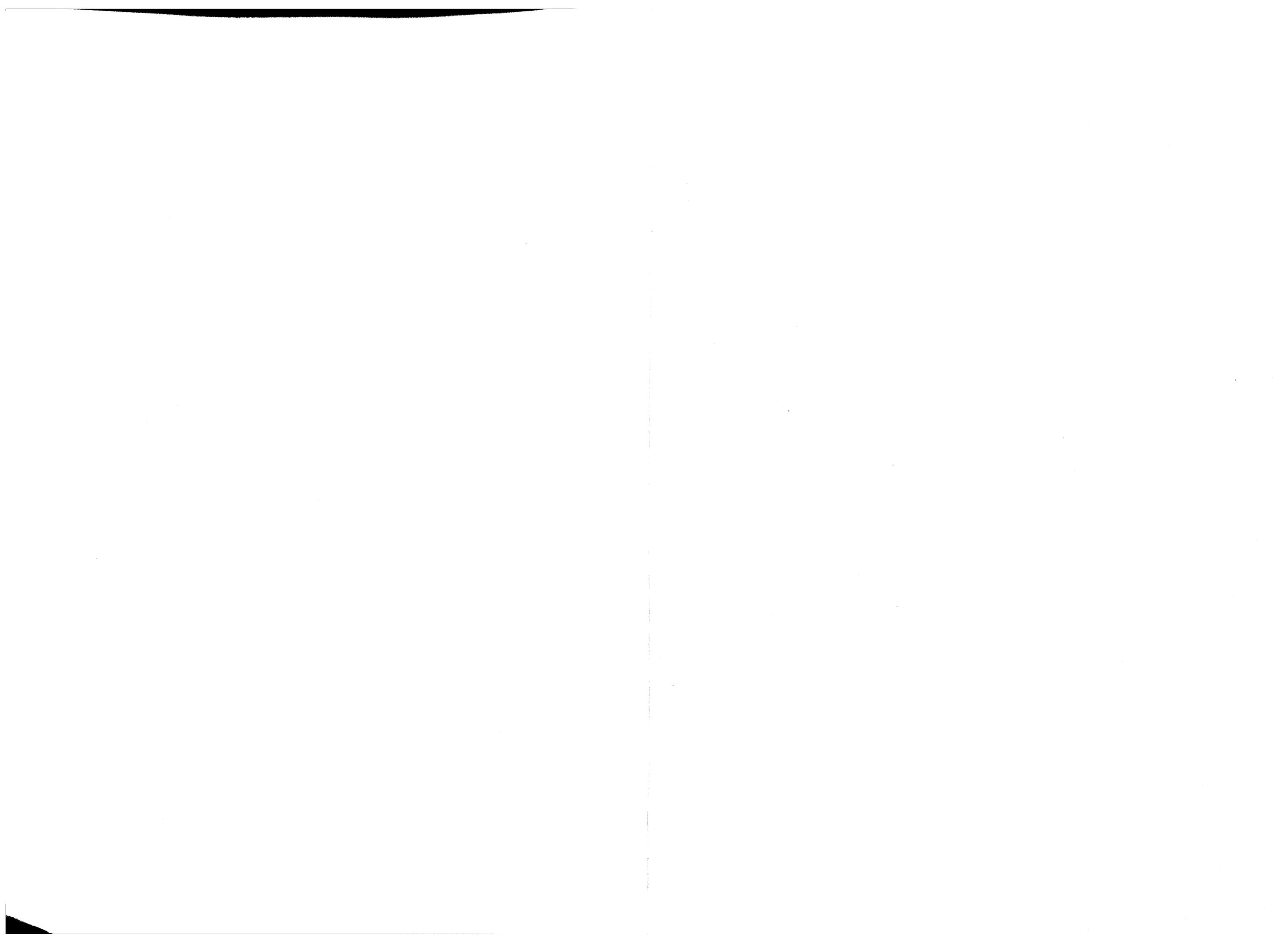


English in Computer Science and Mathematics

$$\lim_{x \rightarrow \infty} \int e^{-y^2} dy = \frac{\sqrt{\pi}}{2}$$



LYNN RUDD AND PAULENE BUTTS

**English
in Computer Science
and Mathematics**



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Dedication

*This book is dedicated to ex-colleagues
whose diligence and good humour made working
with them a pleasure and whose help during
the experimental phase was invaluable.*

PREFACE

This book has been specifically designed for students of computer science and mathematics who require **reading skills** in English to enable them to follow their chosen course of studies and to work with the many authentic texts (text books, instruction manuals, magazines, publicity, etc.) which they will encounter daily.

The book is divided into **three sections** - the **first** consists of **essential grammar units** to be used for the revision and consolidation of the basic grammar points necessary for the comprehension of the texts in the following sections. These units are suitable for use in **basic English courses** and **pre-courses**, as well as being a source of reference for more advanced students. The **second** section consists of **specific texts** dealing with various aspects of **computer science** and the **third** contains **specific texts** regarding different fields of **mathematics**.

Each lesson in **sections 2 and 3** consists of a text with a series of exercises, which assist the student in both a **global** and **detailed** understanding of its contents, initially without a complete word-by-word translation. The skills practised within the exercises are those of **skimming** (reading for the general meaning of the text) and **scanning** (reading for specific information) which the student has undoubtedly already acquired in his/her mother tongue. The student is thus encouraged to draw on these skills and apply them when deciphering a text in English. In fact, the exercises draw on the **many parallels between Italian and English** which are found in the base word, in **word formation** (suffixes, prefixes, etc), and also in certain **grammatical forms**. There are also indications of "**false friends**" – words which appear to the Italian reader to have a certain meaning, which in fact they have not. A **grammar review** is included in the earlier lessons, based on essential grammar points contained in each individual lesson, which is **linked with the essential grammar units in section 1**.

How to profit from this course:

- 1) **Read the text completely** for its principal points and then for details (**if necessary, more than once**) and take note of the **false friends** and **phrasal verbs** listed at the end of each text;
- 2) **Do not stop at unknown words** but try to understand them from the **context of the phrase**;
- 3) **Complete all the exercises.** At this point, the meaning of many of the previously unknown words should become clearer;
- 4) **Read the text again** and this time do a written translation.

The **texts in sections 2 and 3 may be used interchangeably** between computer science and mathematics students for extra practice in deciphering new, unseen texts.

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Basic Grammar Units

SECTION
1

UNIT 1

ALPHABET AND SPELLING

The pronunciation of the letters of the alphabet, as read by an Italian speaker:

A = ei
B = bi
C = si
D = di
E = i
F = ef
G = gi
H = eic
I = ai
J = gei
K = chei
L = el
M = em
N = en
O = ou
P = pi
Q = chiu
R = a: (a long open sound)
S = es
T = ti
U = iu
V = vi
W = dʌbliu
X = echs
Y = uai
Z = zed (British English) zi (American English)

 Practise spelling your name and surname aloud.

 Practise spelling these words and expressions aloud:

operation	back	scientist
multiply	just	happy
recognize	quite	miniaturize
good luck	view	calculate
fetch	exercise	task

STUDENT NOTES

UNIT 2

SOME PRONUNCIATION AIDS

✓ **The “ED” form** (used in the Simple Past tense or past participle of a regular verb):

- this is pronounced (t) after certain consonant sounds, for example:

stop	stopped	(p)t
look	looked	(k)t
pass	passed	(s)t
laugh	laughed	(f)t
etch	etched	(ch)t
push	pushed	(sh)t

- it is pronounced (d) after certain consonant sounds, for example:

dub	dubbed	(b)d
hug	hugged	(g)d
love	loved	(v)d
cram	crammed	(m)d
clean	cleaned	(n)d
travel	travelled	(l)d
use	used	(z)d

- it is pronounced (id) after the consonants “t” and “d”, for example:

wait	waited	(t)id
add	added	(d)id

✓ **The pronunciation of “S” or “ES”** (for the third person singular form of the verb, for the plural of a noun, or for the Saxon Genitive):

- the “s” is pronounced (s) after certain consonant sounds, for example:

write	writes	(t)s
think	thinks	(k)s
cliff	cliffs	(f)s
shop	shops	(p)s
Rick	Rick's	(k)s
desk	desks	(k)s
strength	strengths	(th)s

- it is pronounced (z) after certain consonant sounds, for example:

valve	valves	(v)z
job	jobs	(b)z
bed	beds	(d)z
plug	plugs	(g)z
plum	plums	(m)z
sin	sins	(n)z
travel	travels	(l)z

- it is pronounced (iz) after certain consonant sounds, for example:

weakness	weaknesses	(s)iz
lose	loses	(z)iz
watch	watches	(ch)iz
distinguish	distinguishes	(sh)iz

✓ The group of letters “GN”

- at the beginning or end of a word the “gn” is pronounced (n), for example:

gnome	(n)
sign	(n)

- in the middle of a word the “g” and the “n” are usually pronounced separately, for example:

magnetize	(g)(n)
signal	(g)(n)
recognize	(g)(n)

✓ The double “C”

- this is usually pronounced (k)(s), for example:

accept	(k)(s)
success	(k)(s)
access	(k)(s)

✓ The group of letters “OUGH”

- this group of letters is pronounced in various ways, depending on the word, for example:

enough/rough	(ʌf)
cough	(ɒf)
bought/thought	(ɔ:t)
though	(ou)
through	(u)
bough	(au)

✓ The letters “CH”

- the “ch” in English is usually pronounced (ch), for example:

chip	checker
cheap	chatty
choice	Chinese
chain	achieve

- but sometimes it is pronounced (k), for example:

character	chemicals
characteristic	architectures
mechanism	

✓ The letters “KN”

- the “k” is not pronounced, for example:

know	knife
kneel	knock

✓ The letters “PN” and “PS”

- the “p” is not pronounced, for example:

pneumonia	psychology
-----------	------------

Now practise reading these sentences aloud, paying particular attention to the underlined words:

- 1) The boy stopped, looked right then left and crossed the road.
- 2) When I cleaned my shoes I used that brush.
- 3) We waited an hour for the bus
- 4) I posted a letter to my mother yesterday.
- 5) Those shops don't sell plugs.
- 6) He watches television every evening.
- 7) I didn't recognize you!
- 8) Sign your name here please.
- 9) I can't access the information.
- 10) I thought my cough was bad enough, but yours sounds really rough.
- 11) Though the bough was strong it broke under his weight and he fell through the green-house roof.
- 12) This chatty Chinese child has great character.
- 13) I didn't know that he was a psychiatrist.

STUDENT NOTES

UNIT 3

NUMBERS, DATES, TIMES

✓ **Cardinal numbers:**

0	zero/nought
1	one
2	two
3	three
4	four
5	five
6	six
7	seven
8	eight
9	nine
10	ten
11	eleven
12	twelve
13	thirteen
14	fourteen
15	fifteen
16	sixteen
17	seventeen
18	eighteen
19	nineteen
20	twenty
21	twenty-one
30	thirty
35	thirty-five
40	forty
50	fifty
60	sixty
70	seventy
80	eighty
90	ninety
100	a/one hundred
101	a/one hundred and one
200	two hundred
220	two hundred and twenty
1,000	a/one thousand
1,001	a/one thousand and one
1,221	a/one thousand, two hundred and twenty-one
1,000,000	a/one million
1,003,030	a/one million, three thousand and thirty

NOTICE HOW THE NUMBER WITH A DECIMAL POINT IS INTERPRETED:

1.221 one point two two one

AS OPPOSED TO:

1,221 one thousand, two hundred and twenty-one

 Now write the following numbers in full and  practise reading them aloud:

23 = _____ 39 = _____ 44 = _____
 72 = _____ 99 = _____ 121 = _____
 1,666 = _____ 1,100,110 = _____
 1.666 = _____ 7.268 = _____

✓ Ordinal numbers:

1 st	first
2 nd	second
3 rd	third
4 th	fourth
5 th	fifth
6 th	sixth
7 th	seventh
8 th	eighth
9 th	ninth
10 th	tenth
11 th	eleventh
12 th	twelfth
13 th	thirteenth
14 th	fourteenth
15 th	fifteenth
16 th	sixteenth
17 th	seventeenth
18 th	eighteenth
19 th	nineteenth
20 th	twentieth
21 st	twenty-first
30 th	thirtieth
35 th	thirty-fifth
40 th	fortieth
50 th	fiftieth
60 th	sixtieth
70 th	seventieth
80 th	eightieth
90 th	ninetieth
100 th	a/one hundredth
101 st	a/one hundred and first
200 th	two hundredth

220 th	two hundred and twentieth
1000 th	a/one thousandth
1001 st	a/one thousand and first
1221 st	a/one thousand, two hundred and twenty-first
1,000,000 th	a/one millionth
1,003,030 th	a/one million, three thousand and thirtieth

✓ Percentages:

50% fifty per cent 2 1/2% two and a half per cent 6.25% six point two five per cent

✓ Mathematical operations:

16 + 7 = 23 sixteen plus seven equals/is equal to twenty-three

18 - 5 = 13 eighteen minus five equals/is equal to thirteen

4 x 9 = 36 four times/multiplied by nine equals/is equal to thirty-six

27 ÷ 3 = 9 twenty-seven divided by three equals/is equal to nine

✓ Telephone numbers:

0270 53399 oh two seven oh, five three three nine nine
 oh two seven oh, five double three double nine

✓ Money:

	British	American
1p	a penny/one p	1¢ a/one cent
10p	ten pence/ten p	10¢ ten cents
£1	a/one pound	1\$ a/one dollar
£3.75	three pounds seventy-five pence	\$3.75 three dollars seventy-five cents

✓ Days of the week:

Monday
 Tuesday
 Wednesday
 Thursday
 Friday
 Saturday
 Sunday

N.B. the days of the week must begin with a capital letter

Months of the year:

January
February
March
April
May
June
July
August
September
October
November
December

N.B. the months of the year must begin with a capital letter

The year:

1900	nineteen hundred
1900s	the nineteen hundreds
1907	nineteen oh seven
1990	nineteen ninety
1999	nineteen ninety-nine
2000	two thousand
2002	two thousand and two

The date:

06/09/74 In **British English** this date is read -

the sixth of September nineteen seventy-four/September the sixth nineteen seventy-four

but in **American English** the same date would be read-

June the ninth nineteen seventy-four/the ninth of June nineteen seventy-four

Now write these dates in full (British English) and read them aloud:

25/12/03 = _____
 31/01/98 = _____
 15/08/70 = _____
 04/07/45 = _____
 13/05/83 = _____

The time:

7.00	seven o'clock
8.00 a.m.	seven (informal)
10.00 p.m.	eight a.m./eight o'clock in the morning
7.30	ten p.m./ten o'clock in the evening
	half past seven/seven thirty
	half seven (informal)
7.15	(a) quarter past seven/seven fifteen
7.45	(a) quarter to eight/seven forty-five
9.20	twenty (minutes) past nine/nine twenty
9.55	five (minutes) to ten/nine fifty-five
10.23	twenty-three minutes past ten/ten twenty three
10.46	fourteen minutes to eleven/ten forty-six
16.08	sixteen oh eight
21.00	twenty-one hundred hours

Fractions:

1/2	a/one half	half an hour
1/3	a/one third	a third of a mile
3/4	three quarters	three quarters of a pound
5/8	five eighths	five eighths of an inch
1 1/2	one and a half	one and a half cups

Write these operations in full and read them aloud:

1,000 + 2,555 = 3,555 _____
 1.68 – 0.48 = 1.2 _____
 25 x 4 = 100 _____
 130 ÷ 10 = 13 _____

Practise reading these telephone numbers aloud:

080-5423967; 0274-9961708; 0423-645523; 334-2600498

Write these prices in full and read them aloud:

70p = _____
 £25.50 = _____
 30c = _____
 \$45.4 = _____

 Write these times in full and  read them aloud:

e.g. 08.00 = eight o'clock; 08.10 = ten past eight

10.15 = _____ 12.30 = _____

11.25 = _____ 12.40 = _____

06.45 = _____ 07.50 = _____

11.00 = _____ 11.05 = _____

07.23 = _____ 10.37 = _____

 Write these fractions in full and  read them aloud:

1 1/2 = _____ 2 3/4 = _____

2/3 = _____ 4/5 = _____

4 1/4 = _____ 3/7 = _____

UNIT 4 ARTICLES

 The definite article

The definite article "the" is used for

- a) Countable nouns - singular and plural
(the boy, the boys)
- b) Nouns that are unique because only one exists
(the Sun, the Moon)
- c) Rivers, Canals, Seas, Oceans
(the Pacific Ocean, the Adriatic Sea, the Panama Canal, the Danube River)
- d) Theatres, Cinemas, Hotels, Museums, Galleries
(the British Museum, the Hilton Hotel, the National Gallery)
- e) Expressions with "of"
(the House of Commons, the House of Lords, the Duke of York)
- f) Before a class of people
(the old, the young)
- g) Before superlatives
(the best, the most important)

"the" is not used for

- a) Individual persons
(Mrs. Smith, Mary)
- b) Continents
(America, Africa, Asia)
- c) Nations
(England, Canada)
- d) Lakes and Mountains
(Mount Everest, Lake Como)
- e) Cities and towns
(New York, Milan)
- f) Streets, parks, bridges
(Oxford St., Hyde Park)
- g) Buildings referred to as institutions
(school, prison, hospital, church, university, market, town)
- h) Uncountable nouns when generalising
(meat, history, information)
- i) Time expressions
(in 1978, in Winter, since January)

Exceptions

the entire family
(The Smiths)

plural geographical names
(the United States, the Netherlands)
plural geographical names
(the Alps, the Highlands, the Great Lakes)

(the Hague)
(the Mall, the Brooklyn Bridge, the Oxford Road)
when referring to the building itself
(the prison, the new hospital, the school)
when specifying
(the supermarket meat)
a particular year or period
(in the year 1978, in the Winter of 1978, in the 1970s)

j) Holidays, Days
(at Easter, at Christmas, on Tuesday)

a particular holiday
(the Christmas of 1994, the first Tuesday of the month)

k) Certain parts of the day
(at night, at midday)

other parts of the day
(in the morning, in the afternoon, in the evening)

l) Meals
(breakfast, dinner)

a particular meal
(the breakfast this morning)

m) With "work"
(I'm going to work)

n) With "home" and "bed"
(I'm going home, I'm at home, I'm going to bed, I'm in bed)

o) Before names of games
(He plays golf)

✓ Expressions with and and without the use of "A/AN"

The indefinite article "a/an" is used:

a) with singular countable nouns

(a man, a girl)

b) to indicate a "certain thing"/when giving a general definition
(a whale is a mammal not a fish)

c) with professions, religions, nationalities
(a painter, a Catholic, a Frenchman)

d) in structures using "rather", "quite", "such"
(such a good time, rather a nice picture, quite a hot day)

e) for expressions involving speed and quantity
(20 miles an hour, three times a day)

N.B. "an" is used before a noun or adjective which begins with a vowel or a mute "h"
(an episode, an artist, an Englishman, an awful headache, an hour)

The indefinite article is not used:

a) before plural nouns (singular – a painter, plural – painters)

b) before uncountable nouns (information, advice, money)

c) before abstract nouns (happiness, beauty)

d) before names of meals, unless they are preceded by an adjective (I have lunch at one o'clock.
I had a good lunch today)

ARTICLE ACTIVITIES

✍ Decide whether the words or expressions in brackets require the definite article or not in this text:

Thomas French was one of the greatest explorers in ____ (history). He travelled to ____ (South America), ____ (Greenland) and many other parts of ____ (world). He was born in ____ (1886),

on ____ (Christmas Day). His family lived near ____ (Regent's Park). They were rich and ____ (money) was never a problem. Thomas left ____ (school) because he wanted to go to ____ (sea). He sailed across ____ (Atlantic Ocean) with some friends. At twenty he joined an expedition to ____ (Africa). Later he led expeditions to ____ (Andes), to both Poles and even to parts of ____ (USSR). He also climbed ____ (Mount Everest) twice. ____ (history) of all these journeys is in his diaries, which show us ____ (life) of an explorer in ____ (1920s). ____ (breakfast) was French's favourite meal and he always ate well. He went to ____ (bed) early but often got up at ____ (night) to write his diary. He also took hundreds of photos, which are now on show at ____ (National Gallery).

✍ Insert the indefinite article "a" or "an" if necessary in the following sentences:

- a) My friend is ____ painter; let's ask him for ____ advice about ____ galleries.
- b) We had ____ fish and ____ chips for ____ lunch.
That doesn't sound like ____ very exciting meal.
- c) I've been waiting for the bus for ____ hour.
- d) He is ____ vegetarian; you won't get ____ meat at this house. He'll give you ____ nut cutlet.
- e) I had quite ____ nice day out with my friends.
- f) ____ person who suffers from ____ claustrophobia has ____ dread of being confined in ____ small space, and would always prefer ____ stairs to ____ lift.
- g) Do you take ____ sugar in your tea?
I used to, but now I'm on ____ diet. I'm trying to lose ____ weight.
- h) I have ____ headache and ____ sore throat.
- i) ____ friend of mine is expecting ____ baby. If it's ____ girl she's going to call her Ethel.
That's ____ old-fashioned name for ____ girl.
- j) The escaped prisoner hid in ____ wood, but he didn't light ____ fire because ____ smoke might have attracted ____ attention.
- k) Mr. Jones is ____ old customer and ____ honest man.
Has he been accused of ____ dishonesty?
- l) If you need ____ money I can lend you ten pounds.
- m) He needs ____ assistant with ____ good knowledge of Spanish and ____ experience in using ____ computer.
- n) It's time you had ____ holiday. You haven't had ____ day off for ____ month.
- o) When he was charged with ____ murder he said he had ____ alibi.

STUDENT NOTES

UNIT 5
NOUNS

Types:

- ◊ COMMON e.g. boy, girl, apple
- ◊ PROPER e.g. England, John, Mary
- ◊ ABSTRACT e.g. beauty, love, joy
- ◊ COLLECTIVE e.g. team, fleet, group

Use:

a noun is used as the **SUBJECT** or the **OBJECT** of a sentence.
e.g. **John** is reading a **book**.

Plural forms:

the plural of a noun is usually formed by adding an “s” to the singular:
e.g. apple, apples; door, doors

Exceptions:

- 1) When a noun ends in “o”, “ss”, “sh”, “ch” or “x” it adds “es” in the plural:
e.g. potato, potatoes; dress, dresses; dish, dishes; watch watches; box, boxes
Nouns of foreign origin ending in “o” only add an “s”:
e.g. photo, photos; piano, pianos
- 2) When a noun ends in “y” **preceded by a consonant** the “y” changes to an “i” and adds “es”:
e.g. lady, ladies
When a noun ends in “y” **preceded by a vowel** only an “s” is added:
e.g. key, keys
- 3) **12 nouns** ending in “f” or “fe” change the “f” to a “v” and add “es”:
e.g. calf, calves; half, halves; leaf, leaves; sheaf, sheaves; self, selves; shelf, shelves;
wife, wives; life, lives; knife, knives; thief, thieves; loaf, loaves; wolf, wolves.
Other nouns ending in “f” or “fe” add an “s” in the usual way:
e.g. roof, roofs; cliff, cliffs
- 4) Some nouns form their plural with a **complete vowel change or a different suffix**:
e.g. man, men; woman, women; foot, feet; tooth, teeth; child, children; mouse, mice;
person, people
- 5) Some nouns have the same singular and plural form:
e.g. sheep, sheep; deer, deer; fish, fish (the plural form “fishes” exists but is rarely used)
- 6) Some nouns are always singular:
e.g. This **information** is not sufficient.
My **advice** is not to go out

- His **knowledge** of English is quite good
- 7) Some nouns are always plural:
e.g. The **police** are looking for the thief.
His **trousers** are torn.
These **scissors** aren't very sharp.
- 8) The names of some fields of science end with an "s", but are singular:
e.g. **Mathematics** is sometimes a difficult subject.
Nuclear physics is very interesting.
Informatics is popular.

COUNTABLE AND UNCOUNTABLE NOUNS

Nouns can be divided into two categories: **countable** (with a plural form) and **uncountable** (always singular).

Examples of uncountable nouns: **Materials**: glass, wood, stone, paper, cloth, metals (iron, silver, gold, platinum, copper, etc.)
Food and drink: wine, coffee, tea, ice, water, jam, bread, butter, salt, pepper, beer, meat, milk, fruit, fish, etc.
Others: advice, information, news, baggage, luggage, furniture, knowledge, hair, money.

Therefore it is necessary to use quantitative words to be able to express "a certain quantity of" which can be used before plural nouns and before uncountable nouns.

Some (adjective or pronoun)	used in an affirmative phrase
Any (adjective or pronoun)	used in the negative or interrogative phrase
No (adjective)	used in an affirmative phrase
None (pronoun)	used in an affirmative phrase

✓ Compounds of some/any/no

somebody	someone	something	somewhere	somehow
anybody	anyone	anything	anywhere	anyhow
nobody	no one	nothing	nowhere	nohow

The concept of "**molto**" can be expressed with:

Much → used with uncountable nouns

Many → used with countable nouns

A lot of → used with both countable and uncountable nouns (only in affirmative phrases)

To express the idea of "**scarsità**" we can use:

Not much or very little (some) → used with uncountable nouns

Not many, few, very few (some) → used with countable nouns

To express the idea of "**tanto**" we can use

So much → with uncountable nouns

So many → with countable nouns

To express the idea of "**tropo**" we can use
Too much → with uncountable nouns
Too many → with countable nouns

To express the idea of "**sufficienza**" we can use:
Enough + noun
Adjective + enough

NOMINAL GROUPS

Nominal groups are sequences of **2 or more nouns** which must be deciphered **starting from the final noun** in the group, since the preceding nouns qualify that noun:

Examples: **computer components** = components that are used in computers (i componenti del computer)
fourth generation computers = computers which belong to the fourth generation (i computer della quarta generazione)
a silicon chip = a chip made of silicon (un chip in silicio)
computer technology = the technology used in making computers (la tecnologia dei computer)
processing elements = the elements used in processing (gli elementi di elaborazione)
aircraft navigation systems = systems used for the navigation of aircraft (sistemi di navigazione aerei)
programming languages = languages used for programming (i linguaggi di programmazione)
database management system = the system for the management of the database (il sistema di gestione della base di dati)
circuit design = the design of the circuit (il progetto/modello del circuito)
circuit boards = the boards where the circuits are placed (le schede dei circuiti)
semiconductor devices = devices composed of semiconductors (dispositivi a semiconduttori)

✓ Possessive case (Saxon genitive)

Form

- 1) 's is added to **singular** and **plural** nouns not ending in "s":
e.g. John's book; a man's jacket; men's trousers; the child's room; the children's school.
- 2) For **plural nouns** ending in "s" only an **apostrophe** is added:
e.g. the students' books; the Smiths' house
- 3) Names of people ending in "s" can take either 's or just an **apostrophe**:
e.g. James's car or James' car
However classical names take only an apostrophe:
e.g. Pythagoras' Theorem
- 4) When the possessors are more than one the 's is added to the **last possessor** in the list:
e.g. John and Mary's school

ACTIVITY 1.

 Put the following nouns into their plural form:

- 1) girl, _____
- 2) tomato, _____
- 3) kiss, _____
- 4) latch, _____
- 5) brush, _____
- 6) kimono, _____
- 7) man, _____
- 8) foot, _____
- 9) child, _____
- 10) sheep, _____
- 11) baby, _____
- 12) donkey, _____

ACTIVITY 2.

 Put the verb "to be" into the singular or plural as required by the noun subject:

- 1) The boys _____ at school.
- 2) The apple _____ on the table.
- 3) The potatoes _____ in the kitchen.
- 4) Her trousers _____ too long.
- 5) Electronics _____ a popular subject.
- 6) This information _____ irrelevant.
- 7) The police _____ investigating the crime.
- 8) The deer which live in the forest _____ eating all the wild plants.
- 9) The men _____ in the garden.
- 10) My foot _____ hurting me.

ACTIVITY 3.

 Insert "much", "many", "some" or "any" in the following sentences:

- 1) Is there _____ milk?
Yes, there's _____ in the fridge.
How _____ is there?
There isn't _____.
- 2) Have you got _____ sweets?
Yes, I've got _____.
How _____ have you got?
I've only got three.
- 3) I've drunk _____ wine and _____ beer.
I really think you've drunk too _____!

- 4) I wish _____ one would do _____ thing about that hole in the road.
I don't think _____ one wants to know _____ thing about it!

ACTIVITY 4.

 Translate the following nominal groups into Italian:

- 1) vacuum tubes = _____
- 2) third generation computers = _____
- 3) IBM scientists = _____
- 4) computing equipment = _____
- 5) a massive research effort = _____
- 6) weather forecasts = _____
- 7) a word processor = _____
- 8) the central processing unit = _____
- 9) fourth generation packages = _____
- 10) production-line tasks = _____

ACTIVITY 5.

 Make nominal groups from these groups of words:

- 1) A bank of data _____
- 2) A system of digital computers _____
- 3) Computers used for specific purposes _____
- 4) The components of the memory _____
- 5) A memory which has words consisting of 8 K bytes _____

ACTIVITY 6.

 Give the correct possessive case form of these incorrect expressions:

- 1) The house of Mr. Smith = _____
- 2) The school of the girls = _____
- 3) The car of Mr. Jones = _____
- 4) The room of the children = _____
- 5) The strength of Hercules = _____
- 6) The game of the boys = _____
- 7) The book of the teachers = _____
- 8) The horse of the Prince of Wales = _____
- 9) The vote of the people = _____
- 10) The son of Mr. and Mrs. Smith = _____

STUDENT NOTES

UNIT 6

SOME ESSENTIAL PRONOUNS AND ADJECTIVES

**SUBJECT
PRONOUNS**

I work at the University
YOU speak English well
HE uses the computer
SHE works in a bank
IT bit the postman
WE posted the letter
YOU are learning English
THEY drink tea

Jane works with
He speaks as well as
I am watching
John works with
The postman hit
The letter was posted by
The teacher will teach
The tea is drunk by

ME
YOU
HIM
HER
IT
US
YOU
THEM

**POSSESSIVE
ADJECTIVES**

I am using
You can ride
He is reading
She is drinking
It is eating
We will lend you
This is
They are doing

MY computer
YOUR bicycle
HIS book
HER coffee
ITS food
OUR book
YOUR car
THEIR homework

**POSSESSIVE
PRONOUNS**

It's MINE
It's YOURS
It's HIS
It's HER'S
It's ITS
It's OURS
It's YOURS
It's THEIRS

REFLEXIVE PRONOUNS

I wash
You wash
He washes
She washes
It washes
We wash
You wash
They wash

MYSELF
YOURSELF
HIMSELF
HERSELF
ITSELF
OURSELVES
YOURSELVES
THEMSELVES

**DEMONSTRATIVE
ADJECTIVES**

I like **THIS** dress best
Can I try on **THESE** shoes?

THAT bag is mine
THOSE trousers are John's

**DEMONSTRATIVE
PRONOUNS**

I like **THIS** best
THESE fit better than the others

THAT's mine
THOSE are John's

RELATIVE PRONOUNS

SUBJECT	OBJECT	POSSESSIVE
PERSON	WHO/THAT	WHO/WHOM/THAT
THING	WHICH/THAT	WHOSE/OF WHICH

Examples:

✓ PERSON

The man **who** was talking to you is my father. (**Subject**)

My friend, **who** is pessimistic, says it will rain. (**Subject**)

The man **that** is speaking is my father. (**Subject**)

The man I saw is called Smith. (**The object relative pronoun is implicit**)

She introduced me to her father, **who/whom** I had never met. (**Object**)

The man **whom/who/that** you saw is called Smith. (**Object**)

The people **whose** house you see are very rich. (**Possessive**)

Chopin, **whose** works are very famous, was born here. (**Possessive**)

✓ THING

This is the dog **which** was barking. (**Subject**)

His new house, **which** is enormous, has no garage. (**Subject**)

The glass **that** is empty is mine. (**Subject**)

The bike **which** I rode broke down immediately. (**Object**)

The bike I rode broke down immediately. (**The object relative pronoun is implicit**)

The red apple, **which** I had picked, was delicious. (**Object**)

The dog **that** you hear barking is mine. (**Object**)

Living in a house **whose** walls are made of glass would be terrible. (**Possessive**)

His thesis, **of which** the last fifty pages were copied, was very interesting. (**Possessive**)

✓ USE WITH A PREPOSITION

The man **to whom** I was speaking is her father.

The man **who** I was speaking **to** is her father.

The man I was speaking **to** is her father. (**the relative pronoun is implicit**)

Mary, **with whom** I drove home, has a Rolls Royce.

Mary, **who** I drove home **with**, has a Rolls Royce.
The ladder **on which** I was standing started slipping.
The ladder **which/that** I was standing **on** started slipping.
The wine, **for which** I paid a lot, is awful.
The wine, **which** I paid a lot **for**, is awful.

The patterns used may be:

Preposition + relative pronoun _____

Pronoun + _____ preposition

_____ preposition (no pronoun)

What = "the thing that"

What we saw amused us.

When she sees **what** you have done she will be very angry.

Which can refer to an entire phrase:

He said he had never seen her before, **which** was not true.

Relative Adverbs:

When = in/at which (time) The day **when** they arrived was very cold.

Where = in/at which (place) The hotel **where** they were staying was wonderful.

Why = for which (reason) The reason **why** I am here is to explain the misunderstanding.

ACTIVITY 1.

 Substitute the words in bold type with the correct **object pronoun**:

e.g. I wrote a letter to **Mary**. I wrote a letter to **her**.

1) We gave the letter to **our friends**. We gave the letter to _____.

2) I passed the plate to **John**. I passed the plate to _____.

3) John gave the meat on his plate to **his dog**. John gave the meat on his plate to _____.

4) The teacher explained the verb tenses to **Mary and me**. The teacher explained the verb tenses to _____.

ACTIVITY 2.

 Insert the correct possessive adjective (**linked with the subject**) in the following sentences:

e.g. Peter is getting into **his** car.

1) Margaret is writing _____ life-story.

2) I will show you _____ new house.

3) We are cleaning _____ bedroom.

4) The Art Gallery exhibits _____ paintings.

5) The artists exhibit _____ work in the Art Gallery.

6) Can you lend me _____ book.

7) The sculptor probably performed _____ work in Venice.

ACTIVITY 3.

 Insert the correct relative pronoun in the following sentences:

- 1) It's too dark in here. I can't see _____ I'm doing.
- 2) The student _____ did this exam must be extremely clever.
- 3) The clock _____ used to hang on that wall has been taken to the mender's.
- 4) Yesterday I saw a film about a little boy _____ mother died when he was only five.
- 5) My pen-friend, with _____ I have been corresponding for two years, is coming to visit me next week.
- 6) The house _____ we lived was very old.
- 7) The pen with _____ he was writing his essay broke.
- 8) The boy _____ leg was broken in the accident received a lot of compensation.
- 9) I allowed you to read that letter, _____ I really shouldn't have done.
- 10) She was thinking about the boy with _____ she had spoken that morning.
- 11) Did you hear _____ they said?
- 12) I met somebody _____ mother writes detective stories.
- 13) A pacifist is a person _____ believes that all wars are wrong.
- 14) Mr. Carter, with _____ I spoke on the phone last night, is very interested in our plan.

ACTIVITY 4.

 Make one sentence from two. Use who/that/which:

- 1) A girl was injured in the accident. She is now in hospital.

- 2) A building was destroyed in the fire. It has now been rebuilt.

- 3) A waiter served us. She was very impolite.

- 4) A bus goes to the airport. It runs every half hour.

- 5) Some people were arrested. They have already been released.

- 6) A dictionary is a book. It explains the meaning of words.

- 7) Marconi was a scientist. He invented the telephone.

UNIT 7

REGULAR AND IRREGULAR VERBS

 Paradigm or Three Principle Parts of Verb:

Infinitive	Past Tense	Past Participle
to work	worked	worked
to have	had	had
to be	was/were	been
to do	did	done

Simple Tenses	Compound Tenses
Present I work (io lavoro)	Present Perfect I have worked (io ho lavorato)
Past I worked (io lavorai/lavoravo /ho lavorato)	Past Perfect I had worked (io avevo lavorato)
Future I will work (io lavorerò)	Future Perfect I will have worked (io avrò lavorato)

Progressive Tenses

Present I am working (io sto lavorando)	Present Perfect I have been working (io ho lavorato (continuamente))
Past I was working (io stavo lavorando)	Past Perfect I had been working (io avevo lavorato (continuamente))
Future I will be working (io starò lavorando)	Future Perfect I will have been working (io avrò lavorato (continuamente))

 Verbs

1) Infinitive	Present	to work (lavorare)
	Past	to have worked (aver lavorato)
2) Gerund		working (lavorare/il lavoro = verbo sostantivato)
3) Participle	Present	working (lavorando – nei tempi progressivi; funzionante – come aggettivo)
	Past	worked (lavorato)

 Conditional Form

Present	I would work (io lavorerei)
Past	I would have worked (io avrei lavorato)

✓ Active/Passive Voice

Passive Voice = to be + past participle

Active

Present	he uses the computer
Past	he used the computer
Future	he will use the computer
Present Perfect	he has used the computer
Past Perfect	he had used the computer
Future Perfect	he will have used the computer
Present Progressive	he is using the computer
Infinitive	to use
Present Conditional	he would use the computer
Past Conditional	he would have used the computer

Passive

the computer is used by him
the computer was used by him
the computer will be used by him
the computer has been used by him
the computer had been used by him
the computer will have been used by him
the computer is being used by him
to be used by him
the computer would be used by him
the computer would have been used by him

✓ Sentence order:

Affirmative = Subject + main verb

Interrogative = auxiliary verb (conjugated with subject) + subject + infinitive/participle of main verb (as required by the tense)

Negative = Subject + auxiliary verb (conjugated with subject) + not + infinitive/participle of the main verb (as required by the tense)

SIMPLE TENSES

Simple Present (PRESENTE):

Affirmative

I work
You work
He/she/it works
We work
You work
They work

Interrogative

Do I work?
Do you work?
Does he/she/it work?
Do we work?
Do you work?
Do they work?

Negative

I do not (don't) work
You do not (don't) work
He/she/it does not (doesn't) work
We do not (don't) work
You do not (don't) work
They do not (don't) work

Simple Past (PASSATO REMOTO/PASSATO PROSSIMO/IMPERFETTO):

I worked
You worked
He/she/it worked
We worked
You worked
They worked

Did I work?
Did you work?
Did he/she/it work?
Did we work?
Did you work?
Did they work?

I did not (didn't) work
You did not (didn't) work
He/she/it did not (didn't) work
We did not (didn't) work
You did not (didn't) work
They did not (didn't) work

COMPOUND TENSES

Simple Future (FUTURO):

I will work
You will work
He/she/it will work
We will work
You will work
They will work

Will I work?
Will you work?
Will he/she/it work?
Will we work?
Will you work?
Will they work?

I will not (won't) work
You will not (won't) work
He/she/it will not (won't) work
We will not (won't) work
You will not (won't) work
They will not (won't) work

N.B. “shall” may be found to indicate the **first person singular or plural** in more formal use, but in common everyday use “will” is adopted for **all persons**.

Present Perfect (PASSATO PROSSIMO):

I have worked
You have worked
He/she/it has worked
We have worked
You have worked
They have worked

Have I worked?
Have you worked?
Has he/she/it worked?
Have we worked?
Have you worked?
Have they worked?

I have not (haven't) worked
You have not (haven't) worked
He/she/it has not (hasn't) worked
We have not (haven't) worked
You have not (haven't) worked
They have not (haven't) worked

Past Perfect (TRAPASSATO PROSSIMO):

I had worked
You had worked
He/she/it had worked
We had worked
You had worked
They had worked

Had I worked?
Had you worked?
Had he/she/it worked?
Had we worked?
Had you worked?
Had they worked?

I had not (hadn't) worked
You had not (hadn't) worked
He/she/it had not (hadn't) worked
We had not (hadn't) worked
You had not (hadn't) worked
They had not (hadn't) worked

Future Perfect (FUTURO ANTERIORE):

I will have worked
You will have worked
He/she/it will have worked

Will I have worked?
Will you have worked?
Will he/she/it have worked?

I will not (won't) have worked
You will not (won't) have worked
He/she/it will not (won't) have worked

We will have worked
You will have worked
They will have worked

Will we have worked?
Will you have worked?
Will they have worked?

We will not (won't) have worked
You will not (won't) have worked
They will not (won't) have worked

PROGRESSIVE TENSES

Present Progressive (PRESENTE PROGRESSIVO):

I am working	Am I working?
You are working	Are you working?
He/she/it is working	Is he/she/it working?
We are working	Are we working?
You are working	Are you working?
They are working	Are they working?

I am not (I'm not) working
You are not (aren't) working
He/she/it is not (isn't) working
We are not (aren't) working
You are not (aren't) working
They are not (aren't) working

Past Progressive (PASSATO PROGRESSIVO):

I was working	Was I working?
You were working	Were you working?
He/she/it was working	Was he/she/it working?
We were working	Were we working?
You were working	Were you working?
They were working	Were they working?

I was not (wasn't) working
You were not (weren't) working
He/she/it was not (wasn't) working
We were not (weren't) working
You were not (weren't) working
They were not (weren't) working

Future Progressive (FUTURO PROGRESSIVO):

I will be working	Will I be working?
You will be working	Will you be working?
He/she/it will be working	Will he/she/it be working?
We will be working	Will we be working?
You will be working	Will you be working?
They will be working	Will they be working?

I will not (won't) be working
You will not (won't) be working
He/she/it will not (won't) be working
We will not (won't) be working
You will not (won't) be working
They will not (won't) be working

Present Perfect Progressive (PASSATO PROSSIMO PROGRESSIVO):

I have been working	Have I been working?
You have been working	Have you been working?
He/she/it has been working	Has he/she/it been working?
We have been working	Have we been working?
You have been working	Have you been working?
They have been working	Have they been working?

I have not (haven't) been working
You have not (haven't) been working
He/she/it has not (hasn't) been working
We have not (haven't) been working
You have not (haven't) been working
They have not (haven't) been working

Past Perfect Progressive (TRAPASSATO PROSSIMO PROGRESSIVO):

I had been working	Had I been working?	I had not (hadn't) been working
You had been working	Had you been working?	You had not (hadn't) been working
He/she/it had been working	Had he/she/it been working?	He/she/it had not (hadn't) been working
We had been working	Had we been working?	We had not (hadn't) been working
You had been working	Had you been working?	You had not (hadn't) been working
They had been working	Had they been working?	They had not (hadn't) been working

Future Perfect Progressive (FUTURO ANTERIORE PROGRESSIVO):

I will have been working	Will I have been working?	I will not (won't) have been working
You will have been working	Will you have been working?	You will not (won't) have been working
He/she/it will have been working	Will he/she/it have been working?	He/she/it will not (won't) have been working
We will have been working	Will we have been working?	We will not (won't) have been working
You will have been working	Will you have been working?	You will not (won't) have been working
They will have been working	Will they have been working?	They will not (won't) have been working

CONDITIONAL FORM

Present Conditional (PRESENTE CONDIZIONALE):

I would work	Would I work?	I would not (wouldn't) work
You would work	Would you work?	You would not (wouldn't) work
He/she/it would work	Would he/she/it work?	He/she/it would not (wouldn't) work
We would work	Would we work?	We would not (wouldn't) work
You would work	Would you work?	You would not (wouldn't) work
They would work	Would they work?	They would not (wouldn't) work

Past Conditional (PASSATO CONDIZIONALE):

I would have worked	Would I have worked?	I would not (wouldn't) have worked
You would have worked	Would you have worked?	You would not (wouldn't) have worked
He/she/it would have worked	Would he/she/it have worked?	He/she/it would not (wouldn't) have worked

We would have worked	Would we have worked?	We would not (wouldn't) have worked
You would have worked	Would you have worked?	You would not (wouldn't) have worked
They would have worked	Would they have worked?	They would not (wouldn't) have worked

N.B. “should” may be found to indicate the **first person singular or plural** in more formal use, but in common everyday use “**would**” is adopted for **all persons** and “**should**” is used as the **conditional form** of the modal verb “**must**”.

PASSIVE VOICE

Present Passive (PRESENTE PASSIVO):

I am seen	Am I seen?	I am not (I'm not) seen
You are seen	Are you seen?	You are not (aren't) seen
He/she/it is seen	Is he/she/it seen?	He/she/it is not (isn't) seen
We are seen	Are we seen?	We are not (aren't) seen
You are seen	Are you seen?	You are not (aren't) seen
They are seen	Are they seen?	They are not (aren't) seen

Past Passive (PASSATO PASSIVO):

I was seen	Was I seen?	I was not (wasn't) seen
You were seen	Were you seen?	You were not (weren't) seen
He/she/it was seen	Was he/she/it seen?	He/she/it was not (wasn't) seen
We were seen	Were we seen?	We were not (weren't) seen
You were seen	Were you seen?	You were not (weren't) seen
They were seen	Were they seen?	They were not (weren't) seen

Future Passive (FUTURO PASSIVO):

I will be seen	Will I be seen?	I will not (won't) be seen
You will be seen	Will you be seen?	You will not (won't) be seen
He/she/it will be seen	Will he/she/it be seen?	He/she/it will not (won't) be seen
We will be seen	Will we be seen?	We will not (won't) be seen
You will be seen	Will you be seen?	You will not (won't) be seen
They will be seen	Will they be seen?	They will not (won't) be seen

Present Perfect Passive (PASSATO PROSSIMO PASSIVO):

I have been seen	Have I been seen?	I have not (haven't) been seen
You have been seen	Have you been seen?	You have not (haven't) been seen

He/she/it has been seen	Has he/she/it been seen?	He/she/it has not (hasn't) been seen
We have been seen	Have we been seen?	We have not (haven't) been seen
You have been seen	Have you been seen?	You have not (haven't) been seen
They have been seen	Have they been seen?	They have not (haven't) been seen

Past Perfect Passive (TRAPASSATO PROSSIMO PASSIVO):

I had been seen	Had I been seen?	I had not (hadn't) been seen
You had been seen	Had you been seen?	You had not (hadn't) been seen
He/she/it had been seen	Had he/she/it been seen?	He/she/it had not (hadn't) been seen
We had been seen	Had we been seen?	We had not (hadn't) been seen
You had been seen	Had you been seen?	You had not (hadn't) been seen
They had been seen	Had they been seen?	They had not (hadn't) been seen

Future Perfect Passive (FUTURO ANTERIORE PASSIVO):

I will have been seen	Will I have been seen?	I will not (won't) have been seen
You will have been seen	Will you have been seen?	You will not (won't) have been seen
He/she/it will have been seen	Will he/she/it have been seen?	He/she/it will not (won't) have been seen
We will have been seen	Will we have been seen?	We will not (won't) have been seen
You will have been seen	Will you have been seen?	You will not (won't) have been seen
They will have been seen	Will they have been seen?	They will not (won't) have been seen

Present Progressive Passive (PRESENTE PROGRESSIVO PASSIVO):

I am being seen	Am I being seen?	I am not (I'm not) being seen
You are being seen	Are you being seen?	You are not (aren't) being seen
He/she/it is being seen	Is he/she/it being seen?	He/she/it is not (isn't) being seen
We are being seen	Are we being seen?	We are not (aren't) being seen
You are being seen	Are you being seen?	You are not (aren't) being seen
They are being seen	Are they being seen?	They are not (aren't) being seen

Present Conditional Passive (PRESENTE CONDIZIONALE PASSIVO):

I would be seen	Would I be seen?	I would not (wouldn't) be seen
You would be seen	Would you be seen?	You would not (wouldn't) be seen
He/she/it would be seen	Would he/she/it be seen?	He/she/it would not be seen
We would be seen	Would we be seen?	We would not (wouldn't) be seen
You would be seen	Would you be seen?	You would not (wouldn't) be seen
They would be seen	Would they be seen?	They would not be seen

Past Conditional Passive (PASSATO CONDIZIONALE PASSIVO):

I would have been seen	Would I have been seen?	I would not (wouldn't) have been seen
You would have been seen	Would you have been seen?	You would not (wouldn't) have been seen
He/she/it would have been seen	Would he/she/it have been seen?	He/she/it would not (wouldn't) have been seen
We would have been seen	Would we have been seen?	We would not (wouldn't) have been seen
You would have been seen	Would you have been seen?	You would not (wouldn't) have been seen
They would have been seen	Would they have been seen?	They would not (wouldn't) have been seen

 Now practise putting this sentence into all the tenses and forms mentioned previously:
“John reads the newspaper.”

► SOME COMMON IRREGULAR VERBS

Infinitive	Past Tense	Past Participle	Infinitive	Past Tense	Past Participle
BE	WAS/WERE	BEEN	LEAVE	LEFT	LEFT
BEAT	BEAT	BEATEN	LEND	LENT	LENT
BECOME	BECAME	BECOME	LET	LET	LET
BEGIN	BEGAN	BEGUN	LIE	LAY	LAIN
BITE	BIT	BITTEN	LIGHT	LIT	LIT
BREAK	BROKE	BROKEN	LOSE	LOST	LOST
BRING	BROUGHT	BROUGHT	MAKE	MADE	MADE
BUILD	BUILT	BUILT	MEAN	MEANT	MEANT
BURN	BURNT	BURNT	MEET	MET	MET
BUY	BOUGHT	BOUGHT	PAY	PAID	PAID
CATCH	CAUGHT	CAUGHT	PUT	PUT	PUT
CHOOSE	CHOSE	CHOSEN	READ	READ	READ
COME	CAME	COME	RIDE	RODE	RIDDEN
COST	COST	COST	RING	RANG	RUNG
CUT	CUT	CUT	RISE	ROSE	RISEN
DO	DID	DONE	RUN	RAN	RUN
DRAW	DREW	DRAWN	SAY	SAID	SAID
DREAM	DREAMT	DREAMT	SEE	SAW	SEEN
DRINK	DRANK	DRUNK	SELL	SOLD	SOLD
DRIVE	DROVE	DRIVEN	SEND	SENT	SENT
EAT	ATE	EATEN	SHINE	SHONE	SHONE
FALL	FELL	FALLEN	SHOOT	SHOT	SHOT
FEED	FED	FED	SHOW	SHOWED	SHOWN
FEEL	FELT	FELT	SHUT	SHUT	SHUT
FIGHT	FOUGHT	FOUGHT	SING	SANG	SUNG
FIND	FOUND	FOUND	SIT	SAT	SAT
FLY	FLEW	FLOWN	SLEEP	SLEPT	SLEPT
FORBID	FORBADE	FORBIDDEN	SMELL	SMELT	SMELT
FORGET	FORGOT	FORGOTTEN	SPEAK	SPOKE	SPOKEN
FREEZE	FROZE	FROZEN	SPEND	SPENT	SPENT
GET	GOT	GOT	SPLIT	SPLIT	SPLIT
GIVE	GAVE	GIVEN	STAND	STOOD	STOOD
GO	WENT	GONE	STEAL	STOLE	STOLEN
GROW	GREW	GROWN	SWIM	SWAM	SWUM
HAVE	HAD	HAD	TAKE	TOOK	TAKEN
HEAR	HEARD	HEARD	TEACH	TAUGHT	TAUGHT
HIDE	HID	HIDDEN	TEAR	TORE	TORN
HIT	HIT	HIT	TELL	TOLD	TOLD
HOLD	HELD	HELD	THINK	THOUGHT	THOUGHT
HURT	HURT	HURT	THROW	THREW	THROWN
KEEP	KEPT	KEPT	UNDERSTAND-STOOD	-STOOD	-STOOD
KNOW	KNEW	KNOWN	WAKE	WOKE	WOKEN
LAY	LAID	LAID	WEAR	WORE	WORN
LEAD	LED	LED	WIN	WON	WON
LEARN	LEARNT	LEARNT	WRITE	WROTE	WRITTEN



Find the meanings of these verbs and learn the paradigms by heart

1. IRREGULAR VERB ACTIVITY

N.B. The Simple Past tense is used for actions which finish in the recent or distant past. The Present Perfect tense is used for actions which begin in the past and continue up to the present. They either finish in the present or continue towards the future.

Put the verbs in the following sentences into the Simple Past or the Present Perfect tense as required in context:

- 1) He (go) _____ to the cinema on Friday.
- 2) I (meet) _____ her every Wednesday.
- 3) Since her husband died she always (wear) _____ black.
- 4) This morning I (leave) _____ the house at 9 o'clock.
- 5) Your little boy is crying – I think he (fall) _____.
- 6) At the concert the group (sing) _____ all my favourite songs.
- 7) At Easter I (eat) _____ too much.
- 8) Don't bother to prepare anything, I already (have) _____ lunch.
- 9) I just (speak) _____ to my mother on the phone.
- 10) Last night I (dream) _____ I was flying.
- 11) Ever since I was a child I (get up) _____ at seven o'clock.
- 12) This book was very cheap, it (cost) _____ 50p.
- 13) Please give me some disinfectant, your dog (bite) _____ me.
- 14) I never (feel) _____ so well in all my life.
- 15) This book by James Banister is excellent. You ever (read) _____ any of his books?

2. AUXILIARIES AND ORDINARY VERBS, NEGATIVE AND INTERROGATIVE

Some auxiliaries when used in certain ways make their negative and interrogative according to the rule for ordinary verbs, i.e. with "do" the verbs used in the following examples are either auxiliaries used in these ways or ordinary verbs.

Make the sentences a) negative and b) interrogative, using "do":

- 1) They have eggs for breakfast.
- 2) He needs some new shoes.
- 3) Your cat catches mice.
- 4) They have to work hard.
- 5) She does the cleaning.
- 6) We know the place.
- 7) You like salad.
- 8) He understood me.
- 9) He needed more money.
- 10) You drink tea.

- 11) He had to borrow one.
- 12) The journey takes two hours.
- 13) He made a lot of mistakes.
- 14) She had a look at it.
- 15) Her hair needs cutting.
- 16) It matters very much.
- 17) He does his homework after supper.
- 18) She has a cold shower every morning.
- 19) They like a lot of noise.
- 20) He had to make a speech.
- 21) He does his best.
- 22) He has to get up at five every day.
- 23) They have lunch at one.
- 24) He uses a printer.
- 25) She dared him to climb it.
- 26) You did it on purpose.
- 27) He has his house painted every year.
- 28) They had a good time.
- 29) The drink did him good.
- 30) My watch wants cleaning.
- 31) She came again.
- 32) He had to wait for you.
- 33) You had your fence painted.
- 34) They went by bus.
- 35) They buy ice-creams.

3. NEGATIVE AND INTERROGATIVE FORMS

Put these sentences into the negative and interrogative forms of all the simple and compound tenses:

- 1) I go to work every day.
- 2) I meet her on Wednesdays.
- 3) He always wears black.
- 4) I make the cakes.
- 5) She gets up at 6.30.
- 6) He understands me.
- 7) They have lunch at 1.00.
- 8) She speaks slowly.
- 9) He leaves the house at 8.30.
- 10) I read a chapter of my book every night.
- 11) You eat too much.
- 12) He often falls.
- 13) Ian sings very well.
- 14) It cries when it is hurt.
- 15) He takes the dog out three times a day.
- 16) The curtain rises at 8.00.
- 17) I smoke 50 cigarettes a week.

- 18) They eat shell-fish raw.
 19) I dream every night.
 20) Birds often lay eggs in that nesting box.
 21) I often feel unhappy.
 22) He usually pays £1.00 for a drink.
 23) The dog sometimes bites the postman.
 24) The drink costs £1.00.
 25) She lies down after lunch.
 26) These roses grow well in this soil.
 27) The cat always fights the dog.
 28) We see him every morning.
 29) I often sleep badly.
 30) She always drinks water.

4. THE SIMPLE PRESENT VERSUS THE PRESENT PROGRESSIVE

N.B. The Simple Present tense is used for habitual actions, the Present Progressive for actions which are happening at the moment.

 Put the verb in brackets into the **Simple Present** or the **Present Progressive** tense as required in the context of the sentences:

- 1) You can't see John now: he (have) _____ a shower.
 2) They usually (drink) _____ coffee but today they (drink) _____ tea.
 3) What you (do) _____ in the evenings?
 I usually (play) _____ on the computer or (watch) _____ TV.
 4) You can't go out now as it (rain) _____ and you (not have) _____ an umbrella.
 5) The last bus (leave) _____ at 11.15.
 6) He always (speak) _____ so quickly that I (not understand) _____ him.
 7) Jane (make) _____ a dress for herself at the moment. She (make) _____ all her own clothes.
 8) A lot of youngsters (wear) _____ hats these days.
 9) I (wear) _____ my sunglasses today because the sun is very strong.
 10) You can't have that book now because I (read) _____ it.
 11) The kettle (boil) _____. Shall I make the tea?
 12) You (enjoy) _____ yourself or would you prefer to go home?
 I (enjoy) _____ myself very much. I (want) _____ to stay to the end.
 13) I'm afraid I've broken one of your tea cups.
 Never mind. I (not like) _____ that set anyway.
 14) How he (get) _____ to work generally?
 He usually (go) _____ by bus, but tomorrow he (go) _____ in Peter's car.
 15) Why you (put) _____ on your coat?
 I (go) _____ for a walk. You (come) _____ with me?
 16) She always (buy) _____ lottery tickets but she never (win) _____ anything.
 17) You (like) _____ this necklace? I (give) _____ it to my wife next week for her birthday.

- 18) You (dream) _____ at night?
 Yes and if I (eat) _____ too much supper I (have) _____ nightmares.
 19) You (love) _____ your family?
 20) Who (sing) _____?
 It's Mr. Brown. He (feel) _____ happy.

5. THE PRESENT PERFECT VERSUS THE SIMPLE PAST

N.B. The Simple Past tense is used for actions which finish in the recent or distant past. The Present Perfect tense is used for actions which begin in the past and continue up to the present. They either finish in the present or continue towards the future.

 Put the verbs in brackets into the **Present Perfect** or the **Simple Past** tense as required in the context of the sentences:

- 1) This is my house.
 How long you (live) _____ here?
 I (live) _____ here since 1980.
 2) He (live) _____ in Oxford for three years and then (go) _____ to Cambridge.
 3) You (wear) _____ your hair short when you were at school?
 Yes. my mother (insist) _____ on it. But ever since I (leave) _____ school I (wear) _____ it long.
 4) Shakespeare (write) _____ a lot of plays.
 5) My father (write) _____ several plays. He just (finish) _____ his third comedy.
 6) We (fly) _____ over the Alps yesterday.
 You (see) _____ any snow?
 7) I (not see) _____ my sister for three hours. I wonder where she is.
 8) He (not smoke) _____ for a week. He's trying to give up.
 9) Chopin (compose) _____ some of his music in Majorca.
 10) When she (arrive) _____? She (arrive) _____ ten minutes ago.
 11) You (lock) _____ the door before you left the house?
 12) I can't go out because I (not finish) _____ my homework yet.
 13) I never (drink) _____.
 Well, have some now.
 14) The clock is slow.
 It isn't slow, it (stop) _____.
 15) Here is your cup: I just (wash) _____ it.
 16) You (have) _____ lunch yet?
 Yes. I (have) _____ it at one o'clock.
 17) The newspaper (come) _____?
 Yes. Peter is already reading it.
 18) We (miss) _____ the bus. Now we'll have to walk.
 19) John (break) _____ his arm in a car accident last year.
 20) You (be) _____ here before?
 Yes. I (spend) _____ my holidays here two years ago.
 You (enjoy) _____ yourself?
 Yes. the weather (be) _____ fantastic.

6. ACTIVE TO PASSIVE VOICE

The passive voice is formed with "to be" + past participle: "to be" must be put into the tense desired. Only transitive verbs can be put into the passive voice.

N.B. Notice 1) that the subject and the object of the active sentence are inverted in the passive sentence; 2) the preposition "by" is used before the agent; 3) the object pronoun must be used to substitute the agent; 4) to put a modal verb into the passive form we use the passive infinitive
e.g. active—"he can use the computer"; passive—"the computer **can be used** by him".

Put the following active sentences into the passive voice. Do not mention the agent.

- 1) You should open red wine about three hours before you use it.
- 2) She washed the floor and cleaned the sink.
- 3) Someone will serve refreshments.
- 4) They are delivering my new computer this afternoon.
- 5) They have made these trousers of very cheap material.
- 6) Somebody had cleaned my shoes.
- 7) He rang the door-bell.
- 8) Members of the library may keep books for three weeks. Then they must return them.
- 9) You must leave your bicycle outside.
- 10) The mob broke all the shop windows during the riots.
- 11) They were pulling down the old theatre.
- 12) Someone has stolen my hand-bag.
- 13) They will have used two litres of paint to decorate the room.
- 14) The organisers will exhibit the paintings till the end of the week.
- 15) The thieves had cut an enormous hole in the door.
- 16) Someone cut the tyres with a knife.
- 17) They hadn't mended the roof before it fell in.
- 18) People are spending far more money on food now than five years ago.
- 19) At the library they were starting a new system for returning books.
- 20) The police have asked us a lot of questions about the theft.
- 21) They cannot serve meals after 11 p.m..
- 22) People may use the phone in the hall.

7. VERB TENSE REVIEW

Put the verbs in brackets into the correct tense (Simple Present or Present Progressive):

- a) I (see) _____ my father tomorrow.
- b) You ever (see) _____ accidents like this on the motorway?
- c) My mother (come) _____ to see me every now and then.
- d) Did you hear what he said? He always (be) _____ sarcastic.
- e) He (be) _____ lazy again. He won't do his homework tonight.
- f) My husband generally (wash up) _____ after lunch but I (do) _____ it today.

- g) A football commentator: "Charles (take) _____ the ball and (send) _____ it down towards the goal".
- h) What you (do) _____ in the kitchen now? I (make) _____ the tea.
- i) John (not seem) _____ to (improve) _____ this year.
- j) The milkman (bring) _____ the milk to the door every day.

8. In the following sentences insert a suitable verb in the Present Progressive tense:

- a) We _____ to Milan next week.
- b) Mrs. Brown _____ her daughter to our school next term.
- c) Who _____ with you to the party?
- d) Sam _____ for Spain very shortly.
- e) I _____ my solicitor about this matter this afternoon.
- f) Are you _____ at the next station?
- g) The children _____ their supper in the kitchen tonight.
- h) We _____ football this afternoon.
- i) My cousins _____ to America next spring.
- j) We _____ left at the next cross-roads.

9. Put the verb in brackets into the Simple Past tense, the Past Progressive tense or the "used to" + infinitive form as required in the following sentences:

- a) As children Jack and I often (play) _____ together.
- b) I (live) _____ in South America during the war.
- c) The programme (finish) _____ ten minutes ago.
- d) Once upon a time there (be) _____ a beautiful princess who (live) _____ in a magnificent castle.
- e) My son (do) _____ his homework while I (clean) _____ the kitchen.
- f) When I was a boy my father never (help) _____ me with my homework.
- g) He (run) _____ along the road when he (see) _____ the man.
- h) You (have to) _____ work late again today?
- i) My husband (leave) _____ about three minutes ago; what a pity you (not come) _____ sooner.

10. Rewrite the following sentences, giving the correct form of the verbs in brackets (Present Perfect tense – Active or Passive):

- a) I (not see) _____ her yet.
- b) You (write) _____ this essay very neatly.
- c) They said they would come at five o'clock, but they (not arrive) _____ yet.
- d) I (be) _____ to Rome.
- e) Why you (leave) _____ this cupboard open?
- f) Mr. Smith (not cut) _____ his lawn this week.
- g) How many pages you (write) _____ ?

- h) What you (tell) _____ your mother about me?
 i) I (not see) _____ all the countries of the world.
 j) What you (buy) _____ as a Christmas present for your brother?
 k) I (sell) _____ my old car.
 l) She (write) _____ to her friend in America twice this year.
 m) My sister (have) _____ a bad car-crash.
 n) The building (be painted) _____.
 o) Who he (be taught) _____ by at school this year?

UNIT 8

MODAL VERBS

Modal or defective verbs have **various characteristics which distinguish them from any regular or irregular verb:**

1. “To” is never placed before the infinitive of the modal verb
2. The modal verb is an **auxiliary verb** and is **always followed by the infinitive of another verb without “to”** (except in the short answer: Yes I can/No I can’t).
3. **The third person singular of the Simple Present tense does not require an “s”**
4. **Some tenses of the modal verb are completely non-existent**, therefore **verb synonyms** must be used to form these tenses.

11. Change the verbs in the following sentences into the Future Progressive:

- a) Peter *is coming* back in a minute. _____
 b) Who *will give* me a hand with the food? _____
 c) When *is your father leaving*? _____
 d) *Will you put* your car in the garage? _____
 e) They *are cutting* down the trees in the park tomorrow. _____
 f) My father *won’t cook* the dinner. _____

12. Put the verbs in the following sentences into the Future Perfect Tense:

- a) The train *(arrive)* _____ by the time you get to the station.
 b) You *(finish)* _____ by ten o’clock?
 c) We already *(take)* _____ our examination in a week’s time.
 d) By 2010 I *(be)* _____ here for twenty years.
 e) If you come late we already *(have)* _____ supper.
 f) If you don’t hurry the plane *(leave)* _____ by the time you get to the airport.

13. Use the Simple Past Tense, the Past Perfect Tense or the Past Perfect Progressive Tense as required in the following sentences:

- a) Paul *(live)* _____ in Cambridge for five years when I *(go)* _____ to visit him.
 b) The plane *(fly)* _____ for an hour when it *(crash)* _____.
 c) How many drinks he *(have)* _____ before you *(give)* _____ him that one?
 d) Mr. Smith *(sleep)* _____ for nearly two hours when his wife *(wake)* _____ him up.
 e) She said she *(not receive)* _____ a present since she *(be)* _____ a child.
 f) The police were sure that the car *(be stolen)* _____ by the men they *(see)* _____ loitering in the street.

1. CAN/TO BE ABLE TO + INFINITIVE

CONJUGATION:

Simple Present	I can speak English	Can you speak French?	I can’t speak French
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Simple Past	I could read when I was 5	Could you read when you were 3? I couldn’t read when I...
--------------------	----------------------------------	---

Simple Future	I will be able to go to Spain	Will you be able to go to France?	I won’t be able to go to...
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Present Perfect	I have been able to play the guitar since I was 15	Have you been able to play the piano since you were 15?	I haven’t been able to play the piano since I was 15
------------------------	---	--	---

Past Perfect	I had been able to prepare the cake before they arrived	Had you been able to prepare tea before they arrived?	I hadn’t been able to prepare tea before they arrived
---------------------	--	--	--

Future Perfect	I will have been able to finish by 5 o’clock	Will you have been able to finish by 4 o’clock	I won’t have been able to finish by 4 o’clock
-----------------------	---	---	--

Present Conditional	I could go to Spain if I had 4 days holiday	Could you go to China if you had 4 days holiday?	I couldn’t go to China if I had 4 days holiday
----------------------------	--	---	---

Past Conditional

I **could have gone** to Spain Could you **have gone** to China
 if I had had 4 days holiday if you had had 4 days holiday? I **couldn't have gone** to China
 if I had had 4 days holiday

USE:**1) To express capability (can/to be able to):**

e.g. He **can/is able to** speak English.
 She **could/was able to** ride a horse when she was five.

I **have been able to** sing since I was a child.

2) To express possibility (can/to be able to)

e.g. We **can** ski today because there's a lot of snow.
 The sky is very cloudy; it **could** rain.

There's so much snow that they **have been able to** ski all day.

3) To ask for, give or refuse permission (can/to be allowed to)

e.g. Can I borrow the car tonight? No, you **can't**.
 Could you send me some more information please?
 The children **have been allowed to** stay up late.

2. MAY/TO BE ALLOWED TO + INFINITIVE**CONJUGATION:****Simple Present**

I **may go** May I **go?** I **may not go**

Simple Past

I **might go** Might I **go?** I **might not go**

Simple Future

I **will be allowed to go** Will I **be allowed to go?** I **will not be allowed to go**

Present Perfect

I **have been allowed to go** Have I **been allowed to go?** I **haven't been allowed to go**

Past Perfect

I **had been allowed to go** Had I **been allowed to go?** I **haven't been allowed to go**

Future Perfect

I **will have been allowed to... Will I have been allowed to?** I **won't have been allowed**

Present Conditional

I **might go** Might I **go?** I **might not go**

Past Conditional

I **might have gone** Might I **have gone?** I **might not have gone**

USE:**1) To ask for, give or refuse permission (may/to be allowed to)**

e.g. May I leave the room? No, you may not.
 She said I **might** use her car.

I **have been allowed to** use her car.

2) To express possibility or supposition (may/might)

e.g. The plane **may/might** be late due to fog.
 The sky is very cloudy so it **may/might** rain.
 He **may/might** come to the party.

3. MUST/TO HAVE TO + INFINITIVE**CONJUGATION:****Simple Present**

I **must study** Must I **study?** I **mustn't study**

Simple Past

I **had to leave my job** Had I/did I **have to leave..?** I **hadn't/didn't have to...**

Simple Future

I **will have to phone him** Will I **have to phone him?** I **won't have to phone him**

Present Perfect

I **have had to re-do this** Have I **had to re-do this?** I **haven't had to re-do this**

Past Perfect

I **had had to work** Had I **had to work on Sundays?** I **haven't had to work...**

Future Perfect

I **will have had to finish by Monday** Will I **have had to finish by Tuesday?** I **won't have had to finish by Tuesday**

Present Conditional

I **should/ought to study** Should/Ought I **to study?** I **shouldn't/oughtn't to study**

Past Conditional

I **should/ought to have studied** Should/Ought I **to have studied?** I **shouldn't/oughtn't to have studied**

USE:**1) To express a positive or negative obligation (must/to have to)**

The affirmative or negative form of **MUST** is used to express an **obligation imposed by the speaker:**

e.g. Your shoes are dirty; you **must** clean them.
 You **mustn't** smoke in a hospital

The affirmative form **HAVE TO** is used to express **obligation imposed by external authority or circumstances:**

e.g. I **have to** be in the office by nine o'clock.

2) To express absence of obligation (don't have to/needn't)

e.g. This shirt is clean, so you **don't have to/needn't** wash it

N.B. The negative forms **don't have to/needn't** indicate that an action is **not necessary** and should not be confused with the negative form **mustn't**, which indicates that an action is **prohibited**:

3) To express duty (should/ought to)

e.g. I **should/ought to** go to bed early tonight.

Since the form is conditional, there is always a doubt whether the action is actually performed.

4) To give advice (should/ought to)

e.g. You don't look well; you **should go/ought to** go to the doctor's.

ACTIVITY 1.

 Make these sentences a) negative and b) interrogative in all the simple and compound tenses and conditional forms:

1) They can read English.

2) We may use this one.

3) You must tell him.

ACTIVITY 2.

 Decide how the modal verbs are used in the context of the following sentences (capability, possibility/supposition, permission, absence of permission, obligation, absence of obligation, advice):

1) I can speak French. (_____)

2) You may borrow my book. (_____)

3) You should tell the police about the accident. (_____)

4) We could have a holiday if we wanted to. (_____)

5) You really must study harder. (_____)

6) He can leave his bicycle here. (_____)

7) James is strong, so he can move the wardrobe. (_____)

8) You ought to read the instructions before using that device. (_____)

9) I'm sure he can do without cigarettes. (_____)

10) He doesn't have to come to the meeting. (_____)

11) They might come and see us. (_____)

12) I may be late tonight. (_____)

13) You mustn't interrupt me when I'm speaking. (_____)

14) You needn't get up now. (_____)

15) We must wait for him to come and pick us up. (_____)

16) Susan could read when she was only three. (_____)

ACTIVITY 3.

 Insert an appropriate modal verb or verb synonym in the following sentences, paying particular attention to the context of use, the tense and form (affirmative or negative):

1) He looks very pale, I think he _____ be ill.

2) _____ I use your telephone, please, Mr. Johnson?

3) She _____ ski when she was 10 years old.

4) If you don't feel well, my suggestion is that you _____ see a doctor immediately.

5) Notice in a museum: All umbrellas and cameras _____ be left at the desk.

6) The bus was late and we _____ wait about an hour at the bus-stop.

7) I _____ turn off all the lights and lock the door when I leave the office.

8) I'm taking my umbrella, because it _____ rain.

9) You _____ stay if you don't want to.

10) The children _____ run in the corridor at school.

STUDENT NOTES

UNIT 9

CONDITIONAL FORMS

THE PRESENT CONDITIONAL

✓ FORMATION

I/we	should/would	+	infinitive of main verb
You/he/she/it/they	would	+	infinitive of main verb

N.B. **SHOULD** MAY BE FOUND TO INDICATE THE FIRST PERSON SINGULAR OR PLURAL IN MORE FORMAL USE, BUT IN COMMON EVERYDAY USE **WOULD** IS ADOPTED FOR ALL PERSONS.

AFFIRMATIVE

I/we	should/would	+	work
You/he/she/it/they	would	+	work

INTERROGATIVE

Should/would	I/we	work?
Would	you/he/she/it/they	work?

NEGATIVE

I/we	shouldn't/wouldn't	work
You/he/she/it/they	wouldn't	work

SHORT ANSWER

Yes	I/we	should/would
No	I/we	shouldn't/wouldn't
Yes	you/he/she/it/they	would
No	you/he/she/it/they	wouldn't

✓ USE

A) IN TYPE 2 CONDITIONAL SENTENCES (IF CLAUSES):

If I had time, I **would help** you.

B) FOR OFFERING AND REQUESTING POLITELY:

What **would** you **like** to eat?

I'd like steak and chips with peas please.

C) AS A PAST EQUIVALENT OF A FUTURE TENSE WHEN THE MAIN VERB IS IN THE PAST TENSE:

She thinks she **will be able** to come.
She thought she **would be able** to come.

D) WHEN CHANGING FROM DIRECT TO INDIRECT SPEECH, WHEN THE INTRODUCTORY VERB IS IN THE PAST TENSE:

She said "I **will come** on Thursday".
She said she **would come** on Thursday".

The simple future in direct speech becomes the present conditional in indirect speech.

PAST (OR PERFECT) CONDITIONAL

✓ FORMATION

I/we	should/would	+	have	+	past participle of main verb
You/he/she/it/they	would	+	have	+	past participle of main verb

AFFIRMATIVE

I/we	should/would	have worked
You/he/she/it/they	would	have worked

INTERROGATIVE

Should/would	I/we	have	worked?
Would	you/he/she/it/they	have	worked?

NEGATIVE

I/we	shouldn't/wouldn't	have	worked
You/he/she/it/they	wouldn't	have	worked

✓ USE

A) IN TYPE 3 CONDITIONAL SENTENCES TO EXPRESS UNFULFILLED CONDITIONS (SEE IF CLAUSE)

I **would have phoned** you if I had known you were not well.
(but I didn't know so I didn't phone)

B) AS A PAST EQUIVALENT OF THE FUTURE PERFECT TENSE

I think he **will have arrived** by the time we get home.
I thought he **would have arrived** by the time we got home.

C) TO EXPRESS UNFULFILLED WISHES

I **would have liked** to have seen that film.
(I wanted to see it but I didn't get my wish)

CONDITIONAL SENTENCES (3 TYPES)

⇒ **TYPE 1** to indicate probable occurrences

The verb in the **IF Clause** is in the **present tense**, the verb in the **Main Clause** is in the **future tense**. The IF Clause may come before or after the Main Clause. Sometimes the present tense can be used both in the IF Clause and in the Main Clause to express automatic or habitual actions, or phenomena that are always true.

Examples:

If you **work** hard, you **will pass** the exam
You'll **catch** the train, if you **run** fast.
If you **heat** ice, it melts (or **will melt**).
Ice **melts**, if you **heat** it.

If the **modal** verb is used in the main clause there is no need for the future tense

Example:

If you **work** hard you **can pass** the exam.

If the **imperative form** is used in the main clause there is no need for the future tense:

Example:

Call me if you **pass** the exam

"unless" is also used in type 1 **negative** conditional sentences:

Example:

You **will not** pass the exam **unless** you **study** (if you do not study)

⇒ **TYPE 2** to indicate improbability or unreality

The verb in the **IF Clause** is in the **simple past tense** and the verb in the **Main Clause** is in the **present conditional**. The meaning of the whole sentence can be present or future. (The past tense in the If Clause is not a real simple past, but a **subjunctive** form).

USES OF TYPE 2

- 1) When the supposition is contrary to known facts (**present unreality**);
- 2) When the action in the IF Clause is not expected to take place (**future improbability**);
- 3) Sometimes as an alternative to TYPE 1 to express possible plans or suggestions (**future possibility**).

Examples:

If I **had** a big house, I **would invite** you all to stay. (But I haven't a big house – **present unreality**)
If I **wore** purple shoes, my friends **would laugh** at me (But I don't intend to wear them – **future improbability**)

If we **run**, we'll **catch** it – or – If we **ran**, we'd **catch** it. (**future possibility**)

N.B. The verb "to be" is the only verb which still maintains the **subjunctive** form in the Type 2 conditional sentence – "**WERE**" is used for **all** persons:

If I **were** you I **would study** harder.

If this text **were** easier I **would be able** to understand it better.

⇒ **TYPE 3** to indicate unfulfilled/impossible conditions

The verb in the **IF Clause** is in the **past perfect tense**, the verb in the **Main Clause** in the **past conditional**. The meaning of the clause is in the past.

Examples:

If I **had known** you were arriving today, I **would have prepared** something for tea.

(But I didn't know, so I didn't prepare anything)

If he **had tried** to climb over the wall, he **would have fallen** (But he didn't try, so he didn't fall)

◆ CONDITIONAL OF MODAL VERBS ◆

The conditional forms of modal verbs (CAN – COULD, MAY - MIGHT) exist and are used in front of the main verb to indicate ability or possibility in all types of conditional sentences.

Type 1. If you **work** hard, you **could pass** the exam (**ability**)

Type 2. If you **left** earlier, you **might catch** the train (**possibility**)

Type 3. If he **had left** earlier, he **could have caught** the bus (**ability or possibility**)

CONDITIONAL SENTENCES

☛ Put the verb in brackets into the correct tense depending on the type of conditional sentence given. Then give the other two conditional types of the same sentence.

- 1) If you pass your exam we (celebrate) _____ . (Type _____)
 (Type _____)
 (Type _____)
- 2) What (happen) _____ if I press this button? (Type _____)
 (Type _____)
 (Type _____)
- 3) I would have worked harder if I (have) _____ more time. (Type _____)
 (Type _____)
 (Type _____)
- 4) If you go to London where you (stay) _____ ? (Type _____)
 (Type _____)
 (Type _____)
- 5) If someone offered you one of those cakes, which you (choose) _____ ?
 (Type _____)
 (Type _____)
 (Type _____)
- 6) The flight will be cancelled if the fog (get) _____ thicker. (Type _____)
 (Type _____)
 (Type _____)
- 7) You would concentrate on the lesson better if you (not talk) _____ so much.
 (Type _____)
 (Type _____)
 (Type _____)

8) If you (read) _____ the instructions more carefully you wouldn't have answered the wrong question. (Type _____)

(Type _____)
 (Type _____)

9) If you saw an elephant walking down the street what you (do) _____ ?

(Type _____)
 (Type _____)
 (Type _____)

10) You'll get pneumonia if you (not change) _____ your wet clothes.

(Type _____)
 (Type _____)
 (Type _____)

☛ Put the verb in brackets into the correct tense, depending on the context:

- 1) If we (take) _____ an umbrella with us last night, we would not have got wet.
- 2) If I (not be) _____ at work today, I would be at home watching TV.
- 3) If we (go) _____ in two cars, we'll be more comfortable.
- 4) If it rained every day of the year, the earth (flood) _____ .
- 5) If you (not study) _____ you'll fail the exam.
- 6) If you don't concentrate, you (not understand) _____ .
- 7) If Charles Brown had tried to escape from Alcatraz, he (catch) _____ certainly.
- 8) I would go home now if I (be) _____ you.

STUDENT NOTES

UNIT 10

PHRASAL VERBS

✓ VERBS FOLLOWED BY ADVERBS:

A. These verbs can retain the meaning of the verb and the adverb which follows:

- e.g. 1) I **went away** for a week and **came back** yesterday.
2) He **wrote down** her telephone number and **threw away** the paper.

B. The verb + adverb can take on a new meaning:

- e.g. 3) Our plan didn't **come off** (it didn't succeed); it **fell through** (it failed).
4) I'd like to **give up** (stop) smoking.

C. Some verbs + adverbs have an object (they are transitive):

In examples 2) and 4) the object is a **noun**, so the adverb can be placed either **before** or **after** the object:

- e.g. He **wrote down** her telephone number and **threw away** the paper.
He **wrote her telephone number down** and **threw the paper away**.
I'd like to **give up** smoking
I'd like to **give smoking up**.

⇒ Some other transitive verbs are:

blow up, call off, find out, make up, pick up, put on, put down, put up, try on, take off (remove), tell off, wake up, wash up, work out.

D. If the object is **quite long** the adverb is placed **before** it:

- e.g. I'd like to **give up** smoking forty cigarettes a day.

E. If the object is a **pronoun**, the adverb must be placed **after** the object:

- e.g. He **wrote it down** and **threw it away**.
I'd like to **give it up**.

F. Some verbs + adverbs don't have an object (they are intransitive):

In examples 1) and 3) there is no object:

- e.g. I **went away** for a week and **came back** yesterday.
Our plan didn't come off; it **fell through**

► Some other intransitive verbs are:

fall down, get up, set off (leave), sit down, stand up, take off (rise from the ground), wake up

✓ VERBS FOLLOWED BY PREPOSITIONS (PREPOSITIONAL VERBS):

These verbs usually retain the meaning of the verb, but require a **specific preposition** before the object:

e.g. I **paid for** the car by cheque.

She **listened to** the nine o'clock news.

► Some other prepositional verbs are:

agree with, arrive at, ask for, believe in, belong to, deal with, decide on, depend on, hope for, insist on, laugh at, look after, look at, look for, send for, talk about, talk to, wait for

PHRASAL VERBS - ACTIVITY

► Insert the correct verb, preposition or verb plus preposition in brackets in the following sentences:

- 1) I've _____ for the job and I hope I get it. (succeeded, presented, applied, appointed)
- 2) I never expected you to turn _____ at the meeting. I thought you were abroad.
(in, around, up, on)
- 3) The Second World War _____ in 1939. (broke out, broke up, broke open, broke off)
- 4) We can never relax in this office. New problems are always _____. (coming out, coming up, raising, presenting)
- 5) He's always _____ the Government but he never votes in the elections. (running out, running down, calling off, calling out)
- 6) The meeting _____ at midnight and we all went home. (stopped up, broke through, broke up, stopped off)
- 7) He aimed his gun _____ the target. (to, at, in, on)
- 8) He _____ his engagement just before the wedding. (broke up, broke out, broke away, broke off)
- 9) There are a lot of mistakes in this exercise, I'll have to _____ it again with you.
(come through, instruct, go over, go down)
- 10) Before _____ hope, let's try opening this door. (taking up, giving up, to give up, to take up)

11) He _____ as if he were the boss. (carries out, carries on, carries away, carries in)

12) It was difficult to _____ in the photograph because it had been taken from so far away. (make her over, make her up, make her out)

13) He'll _____ his nervousness once he's on stage. (get through, get off, get away, get over)

14) He asked me what was _____ in the street outside. (succeeding, going on, doing, making out)

15) We were _____ for half an hour in the traffic and so we arrived late. (broken down, kept off, held up, put back)

16) There's no beer left and the pubs are shut, so you'll have to _____. (go off, go through, go for, go without.)

17) She's such an irritating person. I don't know how you can _____ with her.
(stand up, put up, support, listen)

18) The good service at the hotel _____ the poor food to some extent. (made up, made up for, made out, made for)

19) That's the firm we've been _____. (dealing with, treating with, working on, working out)

20) I've been trying to solve this problem for 2 hours, I just can't _____. (work it through, work it out, bring it round, bring it up)

STUDENT NOTES

UNIT 11

QUESTION FORMATION

Make questions for which the following would be reasonable answers. Ask about the words in bold type using question words like **Who?**, **What?**, **Where?**, **When?**, **Why?**, **How?**, **How much/many?**, **How long?**, **What islike?**, **Whose?**, **Which?**:

e.g. I saw **Tom**. Possible question: Who did you see?

When a noun in brackets is placed after a pronoun, use this noun in the question.:

e.g. I saw him (Tom) **today**. Question: When did you see Tom?

✓ Be careful when using the question words “**Who**” and “**What**” when the **subject** of the answer is unknown – the affirmative order is used:

e.g. **Tom** used the computer last. Who used the computer last?
My pen was lying on the table. What was lying on the table?



- 1) They went to **New York**.
- 2) It takes **four hours** to get there.
- 3) I didn't think **much** of it.
- 4) He earns **a hundred pounds** a week.
- 5) He (Tom) was fined **ten pounds**.
- 6) It (my room) is **twice as big as yours**.
- 7) They left the country **ten years ago**.
- 8) They came **by bus**.
- 9) I've been here **for two months**.
- 10) They (the students) went to the **museum** yesterday.
- 11) It (the car) does **fifty miles to the gallon**.
- 12) He met her **in a coffee bar**.
- 13) They (the neighbours) complained about **the noise**.
- 14) He (the clerk) made him **fill in a form**.
- 15) **The pigs** ate them (the apples).
- 16) He got in **by climbing over the wall**.
- 17) **John** bought them (the tickets).
- 18) They (the desks) were very **old-fashioned**.
- 19) I smoke **forty** (cigarettes) a day.
- 20) It (the hotel) was **awful**.
- 21) It (the market) is **a stone's throw** from here..
- 22) I've had it (this cough) **since the beginning of October**.
- 23) He (Guy Fawkes) tried **to blow up Parliament**.
- 24) I'd like to speak to **Mr. Jones** please.

- 25) This is **Tom's**.
- 26) He stopped it (the train) by **pulling the communication cord**.
- 27) I've been waiting **for half an hour**.
- 28) She (Mary) put it **in the dustbin**.
- 29) I threw it away **because I was tired of it**.
- 30) There are **four** (hotels) in the town.
- 31) They left it (the lawnmower) **outside**.
- 32) I found her address by **calling at every house in the village**.
- 33) She (Ann) gave me **duck and green peas** for lunch.
- 34) It (the lake) is **very deep indeed**.
- 35) I borrowed my **brother's car**.
- 36) He buried it **in the garden**.
- 37) He told me **exactly what happened**.
- 38) It (the bridge) is **built of reinforced concrete**.
- 39) We're all going to **watch the cricket match**.
- 40) He broke it (his leg) **in a skiing accident**.
- 41) He (Tom) lost his job **because he kept coming in late for work**.
- 42) I bought **the big one**.
- 43) It (the new theatre) looks **rather like a factory**.
- 44) I'd like **about a dozen**.
- 45) It (the concert) began **at eight p.m.**.
- 46) She went to the dance with **George**.
- 47) He bought one (a car) **because the local railway station closed down**.
- 48) He's coming **at the end of the week**.
- 49) **That** one is longer.
- 50) **Jack** taught me (to play poker).
- 51) She's broken **another of your best plates**.
- 52) I'm looking for **a telephone box**.
- 53) He's borrowed **your typewriter**.
- 54) She was asking him for **a rise/raise**.
- 55) He's ringing up **the police**.
- 56) It (the word "boss") means **employer**.
- 57) He escaped **by climbing over the prison wall**.
- 58) We were talking about **Margaret**.
- 59) They like **Ann's** idea best.
- 60) He complained to **the manager**.
- 61) It was **about the size of an orange**.
- 62) They (the students) intend **to demonstrate against the new regulations**.

UNIT 12

THE USE OF THE "ED" FORM

The "ED" suffix added to the STEM/ROOT of a regular verb indicates

✓ EITHER

A ⇔ The Simple Past Tense

e.g. The processor **EXECUTED** the instructions. He **ELIMINATED** the other choices.
The semi-conductor chip **REVOLUTIONIZED** computing.

✓ OR

B ⇔ The Past Participle

This can be found:

1) IN THE PRESENT/PAST/FUTURE PERFECT TENSE

e.g. The processor **HAS/HAD/WILL HAVE EXECUTED** the instructions.

2) IN THE PASSIVE FORM

e.g. The instructions **WERE EXECUTED** by the processor.

Still faster devices **ARE NEEDED**.

3) USED AS AN ADJECTIVE (**BEFORE** A NOUN)

e.g. **COMPLICATED** procedures

SPECIALIZED programs

PRINTED output

4) IN AN ELLIPTICAL RELATIVE PHRASE (**AFTER** a noun, which may be the **SUBJECT** or the **OBJECT** of the main clause)

e.g. Some firms are relying on **SOFTWARE PRODUCTS DESIGNED** to prevent detect and eliminate computer viruses = **SOFTWARE PRODUCTS WHICH ARE DESIGNED** to prevent

The **PROBLEMS INVOLVED** in controlling fleets of missiles are huge = **THE PROBLEMS WHICH ARE INVOLVED....**

“ED” FORM ACTIVITY

Decide how the “ed” form is used (**simple past, past participle in perfect tense, past participle in passive form, past participle as adjective, past participle in elliptical relative phrase**) in the following sentences:

- 1) Many years ago a need to count was recognized (_____)
- 2) In the early 1800s the first calculating machine appeared. (_____)
- 3) Fourth generation computers have already arrived. (_____)
- 4) An integrated circuit is a tiny chip of silicon. (_____)
- 5) On a chip there are thousands of transistors linked together to make paths.
(_____)
- 6) The components inside the first computers were called valves. (_____)
- 7) Shortly after the appearance of the first calculating machine Babbage designed his machine.
(_____)
- 8) The abacus is still being used by some peoples. (_____)
- 9) The information presented to the machine is the input. (_____)
- 10) They will have produced an optical computer prototype by 2010.
(_____)
- 11) Please write the corrected statement here. (_____)
- 12) T-CELL vaccine can be used to protect a computer system against viruses.
(_____)
- 13) A Swedish company has developed a vaccine against computer bugs.
(_____)
- 14) Computers accept information in the form of instructions called a program.
(_____)

UNIT 13

THE USE OF THE “ING” FORM

✓ **USE AS A GERUND** (Usually translated in Italian by a **NOUN** or an **INFINITIVE**)

The gerund is generally recognized when:

A) It is used as the **SUBJECT** or the **OBJECT** of a sentence (often preceded by **AN ARTICLE**)
e.g. **FLOWCHARTING** is essential for **PROGRAMMING**.

THE SWITCHING is managed by a program which controls **THE FUNCTIONING** of the computer.

B) It is **PRECEDED BY A PREPOSITION OR A CONJUNCTION**

e.g. Memory is a major factor **IN DETERMINING** the performance of a supercomputer.
The mouse is used **FOR NAVIGATING** across the screen.

N.B. **BY MULTIPLYING** the two numbers we obtain the result.

(When **BY** is used before the gerund it may be translated with the Italian **GERUNDIO**)

Writing English is difficult, **BUT SPEAKING** it is much harder.

C) It is **PRECEDED BY AN ADJECTIVE**

e.g. **OUR UNDERSTANDING** of the problem.
EXPENSIVE COMPUTING.
ACCURATE POSITIONING.

D) It follows **CERTAIN VERBS**

e.g. I **LIKE WORKING** with the computer.
She **HATES WALKING**.
He **AVOIDS DRINKING** coffee.

E) It is part of a **COMPOUND NOUN OR A NOMINAL GROUP**

e.g. **NETWORKING**, **TIME-SHARING**, **PRINTING REQUIREMENTS**

N.B. **PRINTING REQUIREMENTS** = THE REQUIREMENTS NECESSARY FOR THE ACTION OF PRINTING.

✓ USE AS A PRESENT PARTICIPLE

The present participle is recognized when it is used:

A) As an **ADJECTIVE** (**BEFORE** a noun, usually corresponding to **AN ADJECTIVE ENDING IN “ANTE” OR “ENTE”** in Italian)

- e.g. An **INTERESTING** document = a document which interests one.
- a **FUNCTIONING** computer = a computer which functions

N.B. As opposed to the nominal group **PRINTING REQUIREMENTS**, which are the requirements for the action of printing and **NOT** requirements which print!

B) In an **ELLIPTICAL RELATIVE PHRASE** (**AFTER** a noun, which may be the **SUBJECT** or the **OBJECT** of the main clause)

- e.g. The central processor handles all the **INFORMATION FLOWING** to or from the computer's memory = the **INFORMATION WHICH FLOWS**

The **COMPONENTS CONTROLLING** the pulses of electricity inside the first computers were called valves = The **COMPONENTS WHICH CONTROLLED** the pulses of electricity

C) IN THE **PROGRESSIVE FORM**

- e.g. Some firms **ARE PROHIBITING** the copying of public domain software.
- International research efforts **ARE MAKING** exciting headway.

D) As the **SECOND** of two contemporary or almost contemporary actions, **BOTH** having the same subject

- e.g. The boy ran into the street **SHOUTING** = As **THE BOY RAN** into the street **HE SHOUTED**.

E) When **ONE ACTION IS THE CAUSE OF THE OTHER**

- e.g. **FEARING** that the police would recognize him, he never went out before dark = **SINCE/AS/BECause HE FEARED** that the police would recognize him he never went out before dark

✓ USE AS A PREPOSITION

In rare cases the “**ING** “ form is used as a preposition

- e.g. **DURING** the 17th and 18th centuries many easy ways of calculating were devised.
- ACCORDING TO** Alan Huang people will soon change their minds about optical computers.
- He has problems **REGARDING** his health.

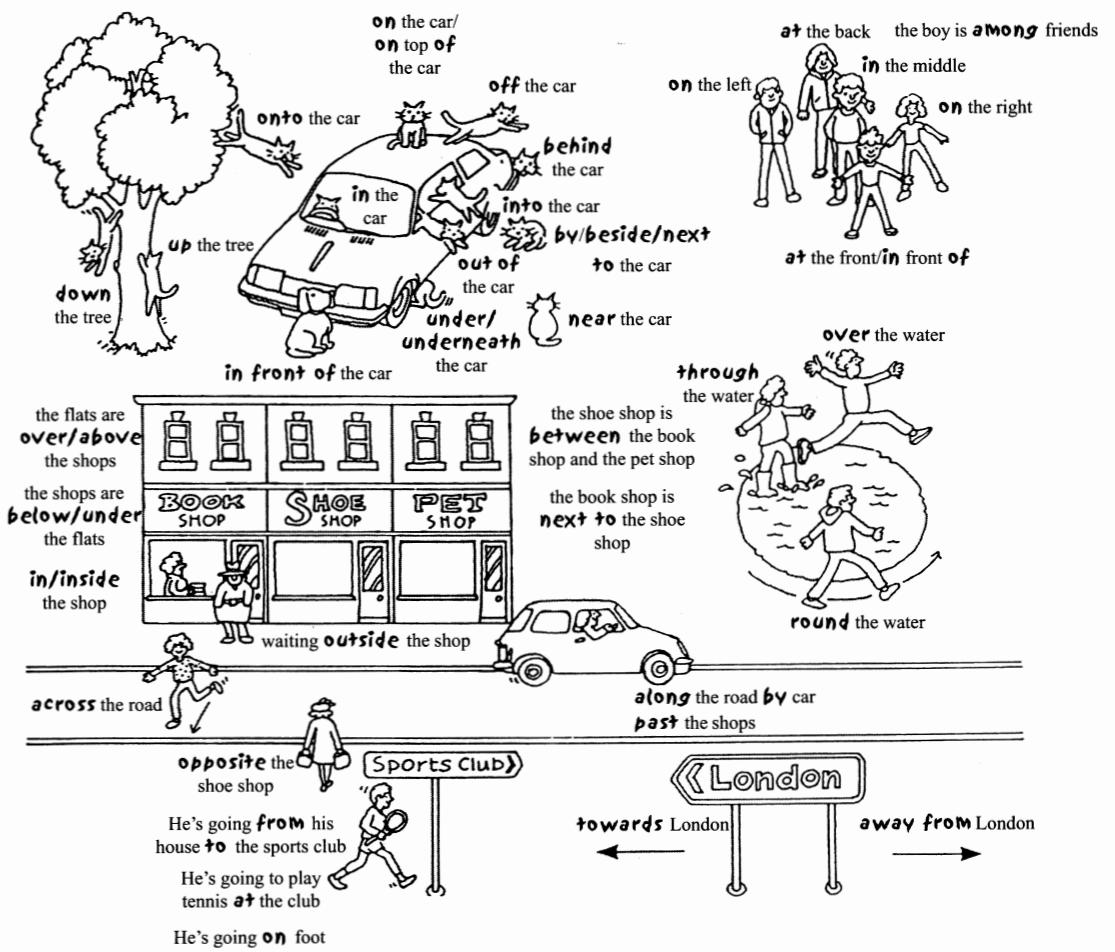
“ING” FORM ACTIVITY

Decide how the “ing” form is used (**gerund, present participle as adjective, present participle in elliptical relative phrase, present participle in the progressive form, preposition**) in the following sentences:

- 1) Many ways of performing calculations had to be used. (_____)
- 2) Somebody had the idea of using first his fingers and then pebbles to keep track of the count. (_____)
- 3) During the 17th and 18th centuries many easy ways of calculating were developed. (_____)
- 4) The abacus is still being used by some peoples. (_____)
- 5) The abacus can be understood without knowing how to read. (_____)
- 6) In the early 1800s the first calculating machine appeared. (_____)
- 7) Two engineers built the first digital computer by using vacuum tubes. (_____)
- 8) The first generation of computers incorporating vacuum tubes was manufactured in 1950. (_____)
- 9) At the rate computer technology is growing, today's computers will certainly be obsolete by the year 2010. (_____)
- 10) The switches, like the cores, are capable of being in either of two states. (_____)
- 11) We can make the machine do what we want by inputting signals. (_____)
- 12) The basic job of computers is the processing of information. (_____)
- 13) Computers have circuits for performing arithmetic operations. (_____)
- 14) The analog computer, as its name implies, produces analogs or parallels of the problem to be solved and represents data in a continuously varying signal. (_____)

STUDENT NOTES

UNIT 14
PREPOSITIONS



✓ USES OF THE PREPOSITION “BY”

The preposition “**by**” has different meanings, depending on the context in which it is used:

- Come and sit down **by** (= near) me.
- Hand this in **by** (= not later than) next Friday.
- This book was written **by** (action done by a person = passive form) Charles Dickens.
- He went **by** (= up to and then beyond/past) the church on his way to work.
- You can send this **by** (= via) e-mail.
- The animals came into the Ark two **by** (= in successive units of) two.
- Divide/multiply ten **by** five (in certain mathematical operations).
- They go **by** bus/train/plane/car (means of transport).

PREPOSITION ACTIVITY

 Insert a suitable preposition in the space provided in the following sentences:

- The submarine was submerged _____ 30 feet of water.
- The firemen climbed _____ the ladder to save the man from a fourth-floor window.
- I usually come _____ Bari _____ train.
- The plates, knives and forks are all _____ the table.
- I've put the milk _____ the fridge, otherwise it will go sour in this heat.
- When the teacher came _____ the classroom all the pupils stood _____.
- The boy behaved so badly that the teacher sent him _____ the room. While he was standing _____ the door the headmaster saw him and took him _____ his study.
- I'm going _____ France _____ August.
- She was born _____ January 12th 1984.
- We must go _____ this tunnel to get to the other side of the mountain.
- When the bus stopped he got _____ and went _____ the nearest shop.
- I am always happy when I am _____ friends.
- The plane was flying so high it was _____ the clouds.
- Gill is _____ Kevin's right and Bob is _____ his left. Kevin is _____ Gill and Bob.
- The actors were waiting _____ the scenes before going on stage.

UNIT 15

COMPARATIVE AND SUPERLATIVE FORMS

✓ FORMATION OF COMPARATIVE AND SUPERLATIVE

There are several ways of showing that similarities or differences exist between or amongst things. The regular comparative and superlative of descriptive words, whether these are adjectives or adverbs, is formed as follows:

- by adding the ending **-er** and **-est** to words of *one syllable*

Examples

	Absolute	Comparative	Superlative
Adjectives	new old big	newer older bigger	newest oldest biggest
Adverbs	soon late	sooner later	soonest latest

N.B. Mono-syllabic adjectives ending in a single consonant preceded by a vowel double the consonant in the comparative and superlative forms

- by placing the words **more** and **most** in front of words with *three or more syllables*

Examples

	Absolute	Comparative	Superlative
Adjectives	interesting convenient beautiful	more interesting more convenient more beautiful	most interesting most convenient most beautiful
Adverbs	easily carefully	more easily more carefully	most easily most carefully

3. words with two syllables may be like 1 or 2 above in that they will add the suffix **-er** and **-est** if they end in **-y** or **-ly**, **-ow**, **-le**, and **-er**. Most of the remaining words take **more** and **most** in front of them.

Examples

	Absolute	Comparative	Superlative
-y	happy funny	happier funnier	happiest funniest
-ly	early friendly	earlier friendlier	earliest friendliest
-ow	shallow narrow	shallower narrower	shallowest narrowest
-le	able gentle	abler gentler	ablest gentlest
-er	clever	cleverer	cleverest

N.B. Two-syllable adverbs ending in **-ly** take **more** or **most**.

Examples

quickly	more quickly	most quickly
slowly	more slowly	most slowly
	Absolute	Comparative
remaining descriptive two-syllable words	careful careless boring awful complex	more careful more careless more boring more awful more complex
		most careful most careless most boring most awful most complex

4. Some common two-syllable adjectives can have either type of formation.

Examples

	Absolute	Comparative	Superlative
common	common	commoner more common	commonest most common
handsome	handsome	handsomer more handsome	handsomest most handsome
polite	polite	politer more polite	politest most polite
quiet	quiet	quieter more quiet	quietest most quiet

5. There are a small number of adjectives and adverbs that form the comparative and superlative using a different stem. These **irregular comparisons** are as follows:

	Absolute	Comparative	Superlative
Adjectives	bad far good many	worse further/farther better more	worst furthest/farthest best most
Adverbs	badly far little much well	worse further/farther less more better	worst furthest/farthest least most best

USE IN SENTENCES

There are many reasons for using comparisons in discourse. They may be used to show: a) equivalence, b) non-equivalence, c) one item compared with another, d) parallel increase.

✓ Equivalence

The following words or constructions are used to show equivalence (i.e. the same).

as+adjective+as	are similar	each
as many+plural noun+as	equal to	either.....or
as much+sing.noun+as	is like	all
the same.....as	similar/ly	both
similar to	equal/ly	alike
the same	compared to/with	

✓ Non-equivalence

The following words and/or constructions are used to show non-equivalence (i.e. not the same).

not as+adjective+as	greater than	unequal (ly)
adjective + er than	not as many+plural noun+as	unlike
more.....than	neither...nor	not the same as
fewer.....than	not as much+sing.noun+as	not all
less.....than	not equal to	

✓ The superlative

The following words and/or constructions are used to show one item compared with others (the superlative).

the adjective + est	the most+adjective	the least+adjective
---------------------	--------------------	---------------------

✓ Parallel increase

The following words and/or constructions are used to show parallel increase (i.e. two comparatives).

the (adjective + er)the more; the (adjective + er)the less

e.g. The bigger the house, the more work you'll have to do.

The smaller the house, the less work you'll have to do.

adjective + er and adjective + er; more + adjective and more + adjective

e.g. Integrated circuits are becoming smaller and smaller.

Computers are becoming more and more intelligent.

ACTIVITY 1.



Write the comparatives and superlatives of these adjectives.

- a) old _____
- b) hard _____
- c) long _____
- d) warm _____
- e) clean _____
- f) happy _____
- g) lazy _____
- h) late _____
- i) big _____
- j) good _____
- k) beautiful _____
- l) comfortable _____
- m) thin _____
- n) noisy _____



False friends

polite = courteous/well-mannered/cordial
comfortable = makes one feel at ease

noisy = loud/creating a lot of resonance
convenient = suited to a particular situation

ACTIVITY 2.



Put the adjective in brackets into the correct comparative or superlative form:

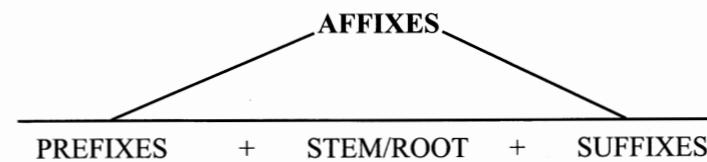
- 1) My sister is (old) _____ than me.
- 2) Mount Everest is (high) _____ mountain in the world.
- 3) Megan Gayle is (beautiful) _____ than Madonna.
- 4) Brad Pitt is (handsome) _____ than Bruce Willis.
- 5) Tom is the (careless) _____ driver in our street.
- 6) Max is (good) _____ than Fred in Maths.
- 7) Philosophy is (boring) _____ subject at school.
- 8) Ellen is (bad) _____ singer in the group.
- 9) Mont Blanc is (low) _____ than Mount Everest.
- 10) English is (interesting) _____ than Algebra.
- 11) Three o'clock in the morning is (quiet) _____ time of the day.
- 12) Jane is (happy) _____ than her brother.
- 13) Samantha is (polite) _____ girl I know.
- 14) Peter is (clever) _____ pupil in the class.
- 15) Florence is (far) _____ than Rome from Bari.

STUDENT NOTES

UNIT 16

WORD FORMATION

When you are reading you will find unfamiliar words. It is often possible to guess the meaning of these words if you understand the way words in English are generally formed.



An English word can be divided into three parts: a prefix, a stem or root and a suffix. *Pre* means ‘before’; a *prefix*, therefore, is what comes before the stem or root. Let’s consider, for example, the prefix **de-** (meaning “reduce” or “reverse”) in a word like **demagnetize** (meaning “to deprive of magnetism”).

A *suffix* is what is attached to the end of the stem. For example, the suffix **-er** (meaning “someone who”) in **programmer** (“the person who programs”).

Both prefixes and suffixes are known as *affixes*.

Prefixes usually change the meaning of the word; for example **un-** changes a word to the negative, as in **able** and **unable**.

Suffixes, on the other hand, change the word from one part of speech to another. For example **-ly** added to the adjective **slow** gives the adverb **slowly** or **-ion** added to the verb **operate** gives the noun **operation**.

Let us consider some prefixes, their usual meanings, and how they change the meanings of English words.

PREFIXES				
SIZE	NEGATIVE AND POSITIVE	LOCATION	TIME AND ORDER	NUMBER
semi-	un-	inter-	pre-	mono-
mini-	non-	super-	ante-	bi-
micro-	in-	trans-	fore-	hex-
	im-	ex-	post-	oct-
	dis-	extra-	mid-	multi-
	re-(positive)			



Now study these tables:

Prefixes of size

PREFIX	MEANING	EXAMPLES
semi-	half, partly	semiconductor
equi-	equal	equidistant
maxi-	big	maxicomputer
mini-	little	minicomputer
micro-	tiny	microcomputer
mega-	very large	megabyte
hyper-	excessively large	hypertext, hypermarket

Negative prefixes

PREFIX	MEANING	EXAMPLES
un-	not, not good enough	unmagnetized
in-		incomplete
im-		impossible
il-		illegal
ir-		irregular, irrelevant
non-	not connected with	non-programmable
mis-	bad, wrong	mispronounce, mistake
dis-	opposite feeling	disagree
	opposite action	disconnect
anti-	against	antisocial
de-	reduce, reverse	demagnetize, decode
under-	too little	underestimate
Positive prefixes	do again	reorganize, redo
		overheat, overestimate
re-		
over-	too much	

Prefixes of location

PREFIX	MEANING	EXAMPLES
inter-	between, among	interface, interactive, international
super-	over	superhuman
trans-	across	transmit, transfer, transatlantic, transcontinental, transaction
ex-	out	exclude, exodus, exit
extra-	beyond	extraordinary
sub-	under	sub-schema, submarine
infra-	below	infra-red
peri-	around	peripheral, periscope, perimeter

Prefixes of time and order

PREFIX	MEANING	EXAMPLES
ante-	before/former/previous	antecedent, antenatal
pre- ex-		prefix, prehistoric, ex-minister
prime-	first	primary, primitive, prime minister
post-	after	post-dated
retro-	backward	retroactive

Prefixes of numbers

PREFIX	MEANING	EXAMPLES
semi-	half	semicircle
mono-	one	monochromatic
bi-	two	binary, bicycle
tri-	three	triangle
quad-	four	quadruple, quadrilateral
penta-	five	pentagon, pentameter
hex-	six	hexagon
sept-	seven	September
oct-	eight	octal, octopus, octosyllabic
deci-/deca-	ten	decimal, decade
multi-	many	multiprogramming, multilingual

Other prefixes

PREFIX	MEANING	EXAMPLES
pro-	for/before	pro-American, prologue
auto-	self	automatic, autobiography
co-	together	co-ordinate, co-operate, collaborate
neo-	new	neo-classical
pan-	all	Pan-American, panorama

ACTIVITY 1.

 **Read the following sentences and underline all the prefixes. Then give a meaning to the word by referring back to the previous tables:**

- 1) Non-impact printers are inexpensive and silent.
- 2) Tape-marks are unmagnetized reflective strips stuck onto the tape.
- 3) The octal and hexadecimal systems are number systems used for reading groups of four binary digits.
- 4) The internal storage locations of a computer are called its primary memory.
- 5) Multiprogramming is when more than one program can be present at different storage locations of the memory at the same time.
- 6) Peripheral devices can be either input or output devices.
- 7) The decoder takes the coded instruction and breaks it down into the commands necessary to carry it out.
- 8) Microcomputers are very important in small business applications.
- 9) A tape-drive transmits the electromagnetic impulses to the memory of the computer.
- 10) Semiconductor materials are used in the making of transistors.

ACTIVITY 2.

 **Fill in the blanks with the correct prefix from the following list.**

multi-	deci-	sub-	auto-
semi-	mono-	mega-	prim-
mini-	de-	inter-	

- 1) _____ byte means approximately one million bytes.
- 2) _____ plexing is when many electrical signals are combined and carried on only one optical link.
- 3) Blocks are separated from each other by marks called _____ block gaps.
- 4) The number system we use in everyday life is the _____ mal system which has a base of 10.

- 5) Terminals are very useful _____ active devices for use in airline reservations.
- 6) Some screens are _____ chromatic whereas others produce multicolour graphics.
- 7) The complete description of the logical structure of data is called the schema and the description of the parts, the _____ schema.
- 8) The main storage locations of a computer are called its _____ ary storage.
- 9) The small ferrite rings called cores have two states: they can be either magnetized or _____ magnetized.
- 10) The introduction of chips or _____ conductor memories made it possible to reduce the size of the computer.

ACTIVITY 3.

 **Read the following paragraph and as you read it, underline the prefixes.**

Computers may have a short history but prior to their development, there were many other ways of doing calculations. These calculations were done using devices that are still used today; the slide rule being a perfect example, not to mention the ten fingers of the hands. These machines, unlike computers, are non-electronic and were replaced by faster calculating devices. It wasn't until the mid-1940s that the first digital computer was built. The post-war industrial boom saw the development of computers take shape. By the 1960s, computers were faster than their predecessors and semiconductors had replaced vacuum tubes only to be replaced in a few years by tiny integrated circuit boards. Due to microminiaturization in the 1970s, these circuits were etched onto wafer-thin rectangular pieces of silicon. This integrated circuitry is known as a chip and is used in microcomputers of all kinds. It has been forecasted that, by the end of this decade, exceptionally faster and smaller computers will replace those in use today.

SUFFIXES

NOUNS	VERBS	ADJECTIVES	ADVERBS
-ance	-ize	-able	-ly
-ence	-ate	-ible	
-or	-fy	-less	
-er	-en	-ic	
-ist		-ical	
-ness		-ish	
-tion		-ive	
-ity			

 Now study these tables:
Noun-forming suffixes

SUFFIX	MEANING	EXAMPLES
-ance	state	performance
-ence	quality of	independence
-er, -or	a person who	programmer, operator, compiler,
-ation	a thing which	accumulator
-tion	the act of	execution, information
-ist	a person who	dentist
-yst		analyst
-ness	condition of	cleanliness
-ion	action/state	conversion
-ing	activity	multiplexing, programming, processing
-ment	state/action	measurement, development
-ity	state/quality	electricity, identity
-ian	a person who belongs to or deals with an area	electrician, musician, Christian, Italian, Egyptian
-ism	condition/state	magnetism, communism
-dom	domain/condition	freedom, kingdom
-ship	condition/state	relationship, partnership, friendship
-hood	condition/state	likelihood, motherhood, brotherhood

Adjective-forming suffixes

SUFFIX	MEANING	EXAMPLES
-al	having the quality of	computational, logical
-ar		circular
-ic		magnetic, automatic, electric
-ical		electrical
-able	capable of being	comparable
-ible		divisible
-ous	like, full of	dangerous
-ious		religious
-ful	characterized by	helpful, useful, careful
-less	without	careless
-ish	like	yellowish
-ed	having been done	integrated, complicated
-ive	quality of	interactive, provocative
-ing	to make or do	operating, interesting

N.B. the suffixes "ic" and "al" may sometimes be found to indicate a noun, e.g. a computer terminal, mathematical logic

Verb-forming suffixes

SUFFIX	MEANING	EXAMPLES
-ize	to make	computerize, magnetize
-ate		automate, activate, navigate
-fy		simplify
-en		harden, widen, lengthen

Adverb-forming suffix

SUFFIX	MEANING	EXAMPLES
-ly	in the manner of	electronically, logically, comparably, helpfully, carefully

ACTIVITY 1.

 Read the following sentences and underline all the suffixes. Then try to find out what parts of speech the words are.

- 1) The systems analyst provides the programmer with the details of the data processing problems.
- 2) CRT terminals are very useful interactive devices for use in offices because of their speed and quietness.
- 3) The new microcomputer we purchased does not have a Fortran compiler. It is programmable in Basic only.
- 4) A computer is a machine with an intricate network of electronic circuits that operate switches or magnetize tiny metal cores.
- 5) In very large and modern installations, the computer operator sits in front of a screen that shows an up-to-date summary of the computer jobs as they are being processed.
- 6) The introduction of terminals and screens has replaced the use of punched cards.
- 7) Binary arithmetic is based on two digits: 0 and 1.
- 8) Multiplexing is when many electrical signals are combined and carried on only one optical link.
- 9) Computers are machines designed to process electronically specially-prepared pieces of information.
- 10) The computed results were printed in tables.

ACTIVITY 2.

 Fill in each blank with the appropriate form of the words. It may be necessary to provide the plural form of the noun or the third-person singular form of the verb.

- 1) operation, operate, operator, operational, operationally, operating, operated
 - a. A computer can perform mathematical _____ very quickly.
 - b. One of the first persons to note that the computer is malfunctioning is the computer _____.
 - c. The job of a computer operator is to _____ the various machines in a computer installation.
 - d. The new machines in the computer installation are not yet _____.
- 2) acceptance, accept, accepted, acceptable, acceptably, accepting
 - a. A computer is a device which _____, processes and gives out information.
 - b. The students are still waiting for their _____ into the Computer Science course.
 - c. I find the idea of creating a new database very _____.
- 3) solution, solve, solvable, solver, solving, solved
 - a. It may take a lot of time to find a _____ to a complex problem in programming.
 - b. A computer can _____ a problem faster than any human being.
 - c. A computer has often been referred to as a problem _____.
- 4) remark, remarkable, remarkably, remarked
 - a. Today's computers are _____ faster than their predecessors.
 - b. Systems analysts will often make _____ about existing programs so as to help make the operations more efficient.
 - c. There have been _____ developments in the field of computer science in the last decade.
- 5) communication, communicate, communicable, communicative, communicably
 - a. A computer must be able to _____ with the user.
 - b. Fibre optics is a new development in the field of _____.
 - c. Some people aren't very _____ because they don't talk much.

UNIT 17

LINKING WORDS

 Linking words connect concepts within the same sentence or between one sentence and another.

 Match the following linking words with their function. Then translate the words into Italian.

FUNCTION	TRANSLATION
1) giving example	_____
2) indicating time sequence	_____
3) listing	_____
4) indicating cause and effect	_____
5) contrasting	_____
6) giving definition	_____
7) adding information	_____
8) comparing	_____
a. on the contrary	_____
b. firstly	_____
c. moreover	_____
d. this/that means	_____
e. due to	_____
f. also	_____
g. earlier	_____
h. such as	_____
i. in other words	_____
j. therefore	_____
k. whereas	_____
l. since	_____
m. however	_____
n. meanwhile	_____
o. for example (e.g.)	_____
p. but	_____
q. finally	_____
r. furthermore	_____
s. nevertheless	_____
t. already	_____
u. that is (i.e.)	_____
v. before	_____
w. as	_____
x. as well as	_____
y. soon	_____
z. next	_____
aa. thus	_____
bb. although	_____
cc. thereby	_____
dd. after	_____
ee. when	_____
ff. for instance	_____

TRANSLATION

despite

in spite of

in fact

indeed

hence

otherwise

regardless of

instead of

and

because of

because

then

owing to

yet

on the one hand

on the other hand

too

once

like

eventually

until(till)

so

consequently

so that

 Now group all these linking words according to their function:

1) Giving example:

2) Indicating time sequence:

3) Listing:

4) Indicating cause and effect:

5) Contrasting:

6) Giving definition:

7) Adding information:

8) Comparing:

LINKING WORD ACTIVITY

 Fill in the gaps with a suitable linking word and write its function in brackets (**contrasting**, **giving example**, **cause and effect**, **time sequence etc.**). Some linking words are used more than once in different contexts. Use these linking words:

(as, then, once, whereas, since, moreover, instead of, in other words, as well as, such as, yet, therefore,)

1) Computers remove many of the routine and boring tasks in our lives, _____ we have more time for interesting creative work. (_____)

2) A small computer may take several steps to perform an operation _____ a larger machine may do the same thing with one instruction. (_____)

3) People used the abacus well into the 16th century _____ it could be understood without knowing how to read. (_____)

4) _____ the 1960s the computer industry has been compelled to make smaller and smaller components. (_____)

5) Second generation computers work faster than their predecessors because they use transistors _____ vacuum tubes. (_____)

6) The CPU, _____, the central processing unit, is that part of the computer which directs the manipulation of information. (_____)

7) Conventional computers are limited since they handle information methodically. _____, they cannot recognise slightly different images easily. (_____)

8) _____ the text has been completed, it should be saved. (_____)

- 9) Computers can do many useful tasks, _____ controlling medical instruments and robots. (_____)
- 10) The computer's results are given back in a human readable form, including charts and graphs words. (_____)
- 11) My friend speaks English _____ me. (_____)
- 12) I haven't finished the exercise _____. (_____)
- 13) The computer can help us in many routine tasks, _____ it cannot make deductive decisions. (_____)
- 14) He prepared the program, _____ he put it into operation.
(_____)
- 15) If x equals 2 and y equals 4, _____ x plus y equals 6.
(_____)
- 16) _____ I was walking home yesterday evening I met my cousin.
(_____)
- 17) _____ I mentioned before, the computer is a very useful machine.
(_____)
- 18) _____ I'm very tired, I'm going home. (_____)

Texts for Computer Science Students



Lesson 1

A CONCISE HISTORY OF COMPUTERS

- (1) There are some who say that computers have a very short history, but prior to their invention many other ways of performing calculations had to be used. More than 5000 years ago, a need to count was recognized, and somebody had the idea of using first his fingers, then pebbles, to keep track of the count. Then the abacus was invented. It was used in some form well into the 16th century and is still being used by some peoples because it can be understood without knowing how to read. During the 17th and 18th centuries, many easy ways of calculating were devised. Logarithm tables, calculus and the basis for the modern slide rule were born out of that period of time.
- (2) It was not until the early 1800s that the first calculating machine appeared, and not too long after, Charles Babbage designed a machine which became the basis for the building of modern computers. The first analog computer was built in 1930 and was used during World War II. The first digital computer was completed in 1944 by IBM scientists. This was the first machine that could calculate long lists of mathematical problems, all at a very fast rate. In 1946 two engineers at the University of Pennsylvania built the first digital computer by using vacuum tubes. The first generation of computers incorporating vacuum tubes was manufactured in 1950. In 1960, the second generation of computers was developed and these could perform calculations ten times faster than their predecessors. The reason for the extra speed was the use of transistors instead of vacuum tubes. The third generation computers, utilizing tiny integrated circuits, appeared on the market in 1965 and could do millions of calculations per second. Fourth generation computers have also arrived and the integrated circuits that are being developed have been greatly reduced in size due to microminiaturization. As many as 1000 circuits fit onto a single chip (a tiny rectangular piece of silicon).
- (3) At the rate computer technology is growing, today's computers will certainly be obsolete by the year 2010.

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False friends (words which don't mean what they seem to mean!)

to devise (line 7) = to create/to invent
to design (line 10) = to plan/ to make a project
by the year 2010 (line 25) = not later than
the rate (line 24) = the speed

Phrasal Verbs

to be born out of + object (line 8) = to appear from/to emerge

EXERCISE 1.

 **Reading for main idea**

Indicate which phrase best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not stated**, **false**, **detail**.

- a) Today's computers will surely be outdated soon _____
- b) In the early 1800s Charles Babbage designed a machine that became the basis for today's computer _____
- c) Ever since man has needed to count, there has been a continual development in the mechanical devices used to lighten his task. _____
- d) Fourth generation computers are 50 times faster than third generation computers. _____

EXERCISE 2.

 **Contextual reference**

What do the following words refer to in the text?

- | | |
|-------------------------------|---------------------------------------|
| a) that period (line 8) _____ | e) it (line 4) _____ |
| b) his (line 3) _____ | f) these (line 17) _____ |
| c) who (line 1) _____ | g) which (line 10) _____ |
| d) this (line 12) _____ | h) their predecessors (line 17) _____ |

EXERCISE 3.

 **Vocabulary study**

Find synonyms or antonyms from the text for the following words:

- Synonyms**
- a) brief (para 1) _____
 - b) including (para 2) _____
 - c) foundation (para 2) _____
 - d) pace (para 3) _____
 - e) invented (para 1) _____

- Antonyms**
- f) huge (para 2) _____
 - g) up-to-date (para 3) _____
 - h) difficult (para 1) _____
 - i) ancient (para 1) _____
 - j) late (para 2) _____

EXERCISE 4.

 **Reading for detail**

Indicate whether the following statements are true or false by referring to the previous text. If TRUE, put a cross on "T" and give a **full numerical line reference**; if FALSE, put a cross on "F" and **correct the statement given in the exercise to make it true**.

- a) Not everyone agrees that computers have a very short history.

"T" line reference _____
 "F" corrected statement _____

- b) Pebbles, then fingers, were used in counting.
 "T" line reference _____
 "F" corrected statement _____
- c) As computers evolved, their size increased.
 "T" line reference _____
 "F" corrected statement _____
- d) In the 1550s the abacus was still being used.
 "T" line reference _____
 "F" corrected statement _____
- e) Logarithm tables were developed before the 17th and 18th centuries.
 "T" line reference _____
 "F" corrected statement _____
- f) Shortly before the appearance of the first calculating machine, Babbage designed his machine.
 "T" line reference _____
 "F" corrected statement _____
- g) The first analog computer was designed in the early 1900s.
 "T" line reference _____
 "F" corrected statement _____
- h) The digital computer was developed before the analog computer.
 "T" line reference _____
 "F" corrected statement _____
- i) The use of transistors instead of vacuum tubes decreased the speed of computers.
 "T" line reference _____
 "F" corrected statement _____

EXERCISE 5.

 **Glossary**

Give a simple concise definition in English of the following terms or concepts.

- a) slide rule _____
- b) transistors _____
- c) digital computer _____
- d) vacuum tubes _____
- e) integrated circuits _____
- f) first generation computers _____
- g) second generation computers _____
- h) third generation computers _____
- i) fourth generation computers _____

EXERCISE 6. **Chronological order**

Determine the chronological order of the following statements with reference to the text.

- _____ Invention of the first digital computer
- _____ Invention of the abacus
- _____ Invention of the first computer using vacuum tubes
- _____ Use of fingers to count
- _____ Invention of computers using integrated circuits
- _____ Invention of first analog computer
- _____ Invention of first calculating machine
- _____ Invention of concept of miniaturization
- _____ Invention of the basis for slide rule and logarithms
- _____ Use of pebbles to count

EXERCISE 7. **Verb formation**

Complete the following irregular verb table:

Infinitive	Simple Past	Past Participle
a) _____	built	given
b) _____		_____
c) to grow	_____	_____
d) to hold	_____	_____
e) _____	_____	become
f) to feel	_____	_____
g) _____	put	_____
h) to find	_____	_____
i) _____	sat	_____

EXERCISE 8. **Numbers**

Write the following cardinal and ordinal numbers:

Cardinal	Ordinal
1	
2	
3	
4	
5	
6	

Cardinal**Ordinal**

- | | |
|------|-------|
| 7 | _____ |
| 8 | _____ |
| 9 | _____ |
| 10 | _____ |
| 20 | _____ |
| 50 | _____ |
| 100 | _____ |
| 1000 | _____ |

 **GRAMMAR REVIEW**

verb table - simple present, past and future

auxiliary verbs: to be, to have, to do

numbers

basic phonetic sounds, alphabet

irregular verbs

parts of speech

various uses of "by"

STUDENT NOTES

Lesson 2

COMPUTER COMPONENTS

- (1) A computer is a machine with an intricate network of electronic circuits that operate switches or magnetize tiny ferrite cores. The switches, like the cores, are capable of being in either of two states, that is, on or off; magnetized or demagnetized. The machine is capable of storing and manipulating numbers, letters and characters. The general idea of a computer is that we can make the machine do what we want by inputting signals that turn certain 5 switches on and turn others off, or that magnetize or do not magnetize the cores.
- (2) The basic job of computers is the processing of information. For this reason, computers can be defined as devices which accept information in the form of instructions called a program and characters called data, perform mathematical and/or logical operations on the information, and then supply the results of these operations. The program which tells 10 the computer what to do, and the data, which provide the information needed to solve the problem, are kept inside the computer in a place called memory.
- (3) All computers have several characteristics in common, regardless of make or design. The information presented to the machine is the input, the internal manipulative operations are the processing, and the result is the output. These concepts of input, processing and output 15 are typical of all human actions.
- (4) Hardware means the actual physical, electronic and electromechanical devices of the computer, while software indicates the programs that control and co-ordinate the activities of the computer and direct the processing of information. The processor or CPU refers to that part of the hardware in which the data manipulations are performed and to the internal 20 memory in which data and instructions are stored. Attached to the CPU are the various input and output devices. When data need to be saved for long periods of time, they are stored on various secondary memory devices.
- (5) Most computers, whether large or small have three basic capabilities: first, computers have circuits for performing arithmetic operations, such as addition, subtraction, 25 multiplication and exponentiation; second, most computers communicate with the user but some are used to control machines, such as robots, aircraft navigation systems, medical instruments; third, computers can make decisions of the type: Is one number less than another? Are two numbers equal? and, Is one number greater than another?
- (6) There are two main types of computing equipment - digital and analog. They work 30 differently and yield different results. The digital computer represents data in binary notation using bits which can be one of two numbers: 0 or 1. The analog computer, as its name implies, produces analogs or parallels of the problem to be solved and represents data in a continuously varying signal.

False friends

to provide (line 11) = to give/to furnish/to supply
actual (line 17) = true/real

several (line 13) = a few/some
the make (line 13) = the name of the company which produces an article

Phrasal Verbs

to turn on (line 5/6) = to activate/to start the flow
to stop the flow

to turn off (line 6) = to deactivate/

EXERCISE 1. **Reading for main idea**

Indicate which phrase best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not stated, false, detail**.

- a) The CPU is attached to the input and output devices. _____
- b) Instructions and data must be given to the computer in order to be processed. _____
- c) Computers can perform deductive operations. _____
- d) Computers are machines capable of accepting and processing information, outputting data, and storing both instructions and data. _____

EXERCISE 2. **Reading for detail**

Indicate whether the following statements are true or false by referring to the previous text. If TRUE, put a cross on "T" and give a full numerical line reference; if FALSE, put a cross on "F" and correct the statement given in the exercise to make it true.

- a) The computer can store or handle data even if it has not received instructions to do so.
"T" line reference _____
"F" corrected statement _____
- b) The information necessary for solving problems can be found in the computer's memory.
"T" line reference _____
"F" corrected statement _____
- c) All computers can perform arithmetic operations, make decisions, and communicate in some way with the user.
"T" line reference _____
"F" corrected statement _____
- d) The hardware co-ordinates the processing of information.
"T" line reference _____
"F" corrected statement _____
- e) Computers can make any type of decision.
"T" line reference _____
"F" corrected statement _____
- f) Analog computers produce parallels of the problem to be solved.
"T" line reference _____
"F" corrected statement _____
- g) Analog computers make use of a numerical form for representing data.
"T" line reference _____
"F" corrected statement _____

EXERCISE 3. **Contextual reference**

Now look at the previous text and find out what the following words refer to.

- a) that (line 1) _____
- b) which (line 8) _____
- c) in which (line 20) _____
- d) which (line 11) _____
- e) they (line 22) _____
- f) first, (line 24) _____
- g) another (line 29) _____
- h) one of two numbers (line 32) _____
- i) its (line 32) _____

EXERCISE 4. **Passive form**

Put the verbs in parentheses into the correct passive form and tense.

Computers then and now

The world's first electronic computer (build) 1) _____ at the University of Pennsylvania in 1946, although computer-like machines already (build) 2) _____ in the 19th century. Computers (sell) 3) _____ commercially for the first time in the 1950s, and a lot of progress (make) 4) _____ since then. Computers are now much smaller and more powerful, and they (can buy) 5) _____ much more cheaply.

Computers (use) 6) _____ in many fields - in business, science, medicine and education, for example. They (can use) 7) _____ to forecast the weather or to control robots which make cars. The computer's memory is the place where information (keep) 8) _____ and calculations (perform) 9) _____.

A computer cannot think for itself - it (must tell) 10) _____ exactly what to do. A lot of difficult calculations (can make) 11) _____ very quickly on a computer, and computers don't make mistakes. Stories (hear) 12) _____ sometimes about computers paying people too much money or sending them bills for things they didn't buy. These mistakes (make) 13) _____ by the programmers - the people who give the computer its instructions. Some years ago, a computer-controlled rocket belonging to the USA went out of control and (must destroy) 14) _____. The accident (cause) 15) _____ by a small mistake in one line of the program.

EXERCISE 5. **Sentence construction**

With reference to the text write a complete sentence using the following series of words. You may need to add articles, auxiliary verbs etc.

a) job/computers/process/information

b) computer/machine/network/circuits

c) computers/characteristics/common

d) input/output/devices/attach/CPU

e) data/store/secondary/memory/devices

f) computers/circuits/perform/operations

EXERCISE 6. **Matching information**

Match the terms in Column A with the definitions in Column B

COLUMN A**COLUMN B**

- | | |
|----------------------------|--|
| 1) _____ circuit | a) a number system using the two digits 0 and 1 |
| 2) _____ core | b) part of the computer system that controls all the other parts and consists of a control unit, an arithmetic and logical unit and memory devices |
| 3) _____ processing | c) a small magnetic ferrite ring used to store data |
| 4) _____ data | d) a computer that uses binary digits (bits) to represent data |
| 5) _____ device | e) a complete path of an electric current |
| 6) _____ program | f) a small machine or piece of equipment such as a keyboard |
| 7) _____ memory | g) a set of instructions used by computers to perform a task |
| 8) _____ output | h) manipulation of information to produce an output |
| 9) _____ input | i) backing store outside the main memory |
| 10) _____ hardware | j) physical, electronic and electromechanical parts of a computer |
| 11) _____ software | k) numbers, text or other information input into the computer |
| 12) _____ CPU | l) part of the computer where data and instructions are stored |
| 13) _____ secondary memory | m) programs that run on a computer |
| 14) _____ digital computer | n) data put into a computer for processing |
| 15) _____ binary system | o) results of a processing operation |

EXERCISE 7. **Sentence formation**

Put the following sentence into the tenses and forms requested:

The analog computer produces parallels of the problem

- a) Simple present interrogative _____
- b) Simple past affirmative _____
- c) Present perfect affirmative _____
- d) Simple future negative _____
- e) Past progressive interrogative _____
- f) Present conditional negative _____
- g) Simple past passive affirmative _____
- h) Present progressive passive interrogative _____

**GRAMMAR REVIEW**

elliptical phrases
prefixes and suffixes
passive form

irregular and regular noun plurals
phrasal verbs

STUDENT NOTES

Lesson 3

INSIDE A COMPUTER

- (1) The components controlling the pulses of electricity inside the first electronic computers were called valves which, however, used a lot of power and became very hot. In the 1950s, a new kind of component, called a transistor, was invented. Transistors used much less power than valves, so they did not become as hot and could be packed closer together in smaller and more reliable computers. The greatest advances, though, came with the 5 invention of integrated circuits, or "chips" as they are often called. An integrated circuit is a tiny chip of a substance called silicon on which there are thousands of minute transistors linked together to make paths, called circuits, through which the electric current passes.
- (2) To make the chips, crystals of silicon 99.999999% pure are grown in a vacuum oven. The silicon is so pure that it will not conduct electricity until it is treated with certain chemicals. 10 The silicon is cut into wafers and up to 500 chips will be made from each wafer.
- (3) Integrated circuits are made by using techniques derived from lithography. The circuit containing the components for a chip is designed with the help of a computer. It is drawn out 250 times larger than it will be on the chip. Some chips have eleven or more different circuits containing tens of thousands of electronic components, built up one on top of the 15 other in the silicon.
- (4) Then the circuit design is reduced to chip size and optically projected lots of times onto each wafer of silicon. This is done in ultra-clean air-conditioned laboratories which are about a hundred times cleaner than a modern hospital operating room, so that no dust gets 20 on the circuits.
- (5) The silicon wafers are placed in a furnace at a temperature of over 1000°C and exposed to certain chemical elements. In the great heat of the furnace, atoms of the chemicals enter the surface of the silicon, but only along the lines of the circuits. The complete circuit may take 20 lithographic steps.
- (6) Stages four and five are repeated several times until each chip contains several different 25 circuits of chemically treated silicon through which electric current can pass. The circuits are tested - up to 70% are marked as faulty - and then the wafers are cut up into chips with a diamond or laser saw.
- (7) Each tiny chip is then put in a plastic case with gold wires connecting the circuits in the silicon to the pins on the case. This makes the chip easier to handle and to fit into the 30 equipment it will eventually be part of.
- (8) Some silicon chips (without their plastic cases) are so tiny they can fit through the eye of a needle, yet each chip contains more electronic components than the room-sized computers of 50 years ago. If a chip is enlarged, the patterns of lines you are able to see are its 35 circuits. These contain the components and are the part of the chip through which the current passes.
- (9) There are lots of different kinds of chips and each kind has circuits specially designed to do a certain job. There are special chips for the central processing unit of the computer and for the memory store, and others to do the work in the arithmetic unit. Some chips have circuits which can do the work of all the different parts of a computer. They are called 40 microprocessors.

20

25

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35

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- (10) If the circuits on a microprocessor are enlarged, you can see the parts which do the same work as a computer. Chips like these are used in computers, as well as in calculators, electronic games, and equipment such as washing machines.
- (11) The chips for each part of the computer are mounted together on boards called printed circuit boards. The chips are connected by narrow bands of metal printed on the board, which carry the electricity to the chips. Then the boards are put together to make the computer. 45
- (12) Inside a small computer you can see how little space the circuit boards need. Silicon chips, which are very cheap to produce, have made it possible to build small, quite powerful computers more cheaply than ever before. 50

False friends

advances (line 5) = progress
 substance (line 7) = material
 silicon (line 7) = a natural substance (silicone = a man-made substance)
 up to (line 11) = as far as (and no further than) a maximum limit
 larger (line 14) = bigger (not wider)
 to project (line 17) = to transfer an image by means of light beams
 a design (line 17) = a model/a pattern
 to take (time) (line 24) = to require a certain period of time
 eventually (line 31) = in the end
 as well as (line 43) = also/too

Phrasal Verbs

to draw something out (line 13/14) = to sketch/to prepare/to formulate (in designer terms)
 to cut up (line 27) = to cut into very small pieces

GRAMMAR NOTE

“yet” is a linking word when it is used at the beginning of an affirmative sentence or phrase to mean “however” (see line 33)

EXERCISE 1.

Reading for detail

Indicate whether the following statements are true or false by referring to the previous text. If TRUE, put a cross on “T” and give a full numerical line reference; if FALSE, put a cross on “F” and rewrite the statement given in the exercise to make it true.

- a) The first electronic computers used transistors.
 “T” Line reference _____
 “F” Corrected sentence _____
- b) The use of transistors made it possible to build smaller computers.
 “T” Line reference _____

- “F” Corrected sentence _____
- c) Chips are integrated circuits.
 “T” Line reference _____
 “F” Corrected sentence _____
- d) A chip is usually fixed to a plastic case.
 “T” Line reference _____
 “F” Corrected sentence _____
- e) Pure silicon conducts electricity well.
 “T” Line reference _____
 “F” Corrected sentence _____
- f) A wafer of silicon can produce about half a thousand chips.
 “T” Line reference _____
 “F” Corrected sentence _____
- g) The circuits are designed directly on the chip.
 “T” Line reference _____
 “F” Corrected sentence _____
- h) Dust damages the circuits.
 “T” Line reference _____
 “F” Corrected sentence _____
- i) Heat makes the chemical enter the lines of the circuits.
 “T” Line reference _____
 “F” Corrected sentence _____
- j) Silicon wafers are put in the furnace several times.
 “T” Line reference _____
 “F” Corrected sentence _____
- k) Each wafer of silicon is put into a plastic case.
 “T” Line reference _____
 “F” Corrected sentence _____
- l) The current passes through circuits.
 “T” Line reference _____
 “F” Corrected sentence _____
- m) All kinds of chips have the same circuits.
 “T” Line reference _____
 “F” Corrected sentence _____
- n) Microprocessors can do all the work of a computer.
 “T” Line reference _____
 “F” Corrected sentence _____
- o) Chips have made it possible to build smaller computers, but at a higher price.
 “T” Line reference _____
 “F” Corrected sentence _____

EXERCISE 2. **Sequential order**

Put the various steps of manufacturing chips into their correct sequential order.

- a) The circuit is reduced to chip size. _____
- b) The chemicals enter the surface of the silicon. _____
- c) The wafers are cut up into chips. _____
- d) The silicon is cut up into wafers. _____
- e) The silicon wafers are placed in a furnace. _____
- f) Each chip is put in a plastic case. _____
- g) Crystals of pure silicon are grown. _____
- h) The chips are connected by narrow bands of metal. _____
- i) The faulty circuits are considered imperfect. _____
- j) The circuit is designed. _____
- k) The boards are put together to make a computer. _____
- l) The circuit design is photographically copied onto each wafer of silicon. _____
- m) The circuits are tested. _____
- n) The chips are mounted on a printed circuit board. _____

EXERCISE 3. **Vocabulary study**

Match the following words with their synonyms.

- | | |
|----------------------------|--|
| a) packed (line 4) _____ | 1) similar to _____ |
| b) handle (line 30) _____ | 2) supports _____ |
| c) reliable (line 5) _____ | 3) inexpensive _____ |
| d) saw (line 28) _____ | 4) many _____ |
| e) dust (line 19) _____ | 5) little pieces of wire for holding _____ |
| f) faulty (line 27) _____ | 6) crammed _____ |
| g) lots of (line 37) _____ | 7) a cutting tool with teeth _____ |
| h) boards (line 46) _____ | 8) manipulate _____ |
| i) cheap (line 50) _____ | 9) dependable _____ |
| j) like (line 43) _____ | 10) imperfect _____ |
| k) pins (line 30) _____ | 11) powdered particles _____ |

EXERCISE 4. **Focus**

With reference to the text, match the following words and expressions in Column A with their grammatical functions in Column B:

COLUMN A

- a) controlling (line 1) _____
- b) integrated (line 6) _____
- c) linked (line 8) _____
- d) using (line 12) _____
- e) easier (line 30) _____
- f) designed (line 37) _____
- g) which (line 50) _____
- h) powerful (line 50) _____
- i) made (line 50) _____
- j) more cheaply (line 51) _____

COLUMN B

- 1. word with noun-forming suffix _____
- 2. gerund _____
- 3. comparative form _____
- 4. past participle as adjective _____
- 5. superlative form _____
- 6. word with adjective-forming suffix _____
- 7. relative pronoun _____
- 8. reflexive pronoun _____
- 9. present participle in elliptical relative phrase _____
- 10. past participle in elliptical relative phrase _____
- 11. simple past _____
- 12. past participle in present perfect tense _____

EXERCISE 5. **Sentence formation**

Put the following sentence into the tenses and forms required:

The manufacturers cut the silicon wafers into chips

- a) Simple present interrogative _____
- b) Simple past negative _____
- c) Simple future affirmative _____
- d) Present perfect affirmative _____
- e) Past perfect interrogative _____
- f) Future perfect negative _____
- g) Present progressive affirmative _____
- h) Present perfect progressive affirmative _____
- i) Present conditional affirmative _____
- j) Past conditional affirmative _____
- k) Simple future passive negative _____
- l) Simple past passive interrogative _____

EXERCISE 6.** Comparative form**

With reference to the text "Inside a Computer" complete the following sentences using suitable comparative forms of the adjective given in brackets:

- a) Valves used _____ power _____ transistors. (much)
- b) Transistors did not become _____ valves. (hot)
- c) Today computers are becoming _____ and _____. (small)
- d) A modern hospital operating room is _____ a laboratory where chips are made. (clean)
- e) Some chips are _____ the eye of a needle. (tiny)

EXERCISE 7.** Word formation**

Complete the following table with the part of speech required:

NOUN	VERB	ADJECTIVE	ADVERB
_____	_____	reliable	_____
_____	operate	_____	_____
_____	_____	electric	_____
_____	_____	_____	specially
invention	_____	_____	_____
activity	_____	_____	_____

 GRAMMAR REVIEW

- comparatives and superlatives
- modal verbs
- relative pronouns
- various uses of "yet"
- linking words

Lesson 4**SEMI-CONDUCTOR MATERIALS**

- (1) In semiconductor devices, speed is of paramount importance. The fastest devices in existing computers can switch a current on or off in about a billionth of a second. Still faster devices are needed, however. They are essential to the construction of more powerful supercomputers, and they would also make possible the building of new kinds of radars and communication satellites operating in the microwave band as well as at higher frequencies. 5
- (2) To meet these needs, new semiconductor technologies are being developed in laboratories throughout the world. One way to speed up the operation of semiconductor devices is to make them smaller, thereby shortening the distance which electrons carrying a signal must travel. Another way to increase the speed of a semiconductor device is to increase the 10 velocity of the electrons that flow through it. Technologies adopting this approach are generally based not on the traditional semiconducting element, silicon, but on a semiconducting compound, gallium arsenide.
- (3) Several properties of silicon render it suitable for use in integrated circuits. One such property is the size of its bandgap, that is, the difference in energy between valence electrons 15 and conduction electrons. If the gap is too small, even a small increase in temperature will send many electrons into the conduction band, interfering with the precise control of electrical properties required in the device. Silicon, however, has a sufficiently large bandgap for the material to maintain excellent semiconductor properties over a wide temperature range. In addition, its native oxide, silicon dioxide, is an outstanding insulator with some 20 desirable attributes for making integrated circuits. No other material has such a combination of qualities, which helps to explain the dominance of silicon in the fabrication of integrated circuits.
- (4) In recent years, however, certain limitations have elevated another semiconductor, gallium arsenide, to a position of great importance. Atoms in a gallium arsenide crystal have nuclear 25 charges and electron distributions that differ significantly from those of the atoms in a silicon crystal. The main property is the fact that an electron traveling through a gallium arsenide crystal seems to have a smaller mass than that of an electron traveling through a silicon crystal. This effect can be applied to make a semiconductor device whose high-speed performance cannot be duplicated by conventional silicon-based devices. 30
- (5) As transistors become smaller, however, this advantage may be reduced by other factors. For instance a transistor can be made to operate faster by applying more power to it, but so doing increases the buildup of heat in the device. Because silicon has three times the thermal conductivity of gallium arsenide, very small silicon devices may be able to function just as fast as those made of the ostensibly "faster" material. Therefore, a choice between 35 the two materials involves weighing up their relative advantages and limitations.

False friends

as well as (line 5) = also (unless it is used in a comparative form)
large (line 18) = big

Phrasal verbs

to switch on (line 2) = to activate/to start the flow of
to switch off (line 2) = to deactivate/to stop the flow of
to speed up (line 8) = to accelerate
to weigh up (line 36) = to evaluate/to consider

EXERCISE 1.

Reading for main idea

Indicate which phrase best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not stated, false, detail**.

- a) Gallium arsenide has electronic properties which could increase the speed of semiconductor devices. _____
b) The speed of semiconductor devices can be augmented by decreasing their size or increasing the velocity of the flow of electrons through them. _____
c) The most significant advance in the past 50 years has been the increase in the number of transistors on a single chip. _____
d) Silicon has been found to be highly superior to gallium arsenide in integrated circuits. _____

EXERCISE 2.

Reading for detail

Decide whether the following statements are true or false by referring to the text. If TRUE, put a cross on "T" and give a full numerical line reference; if FALSE, put a cross on "F" and rewrite the statement given in the exercise to make it true.

- a) If semiconductor devices are made smaller, the distance which an electron has to travel is shorter.
"T" Line reference _____
"F" Corrected statement _____
b) Silicon is a better thermal conductor than gallium arsenide.
"T" Line reference _____
"F" Corrected statement _____
c) A small bandgap means that too few electrons are sent into the conduction band when there is a slight rise in temperature.
"T" Line reference _____
"F" Corrected statement _____

- d) Electrons in gallium arsenide crystals appear to be smaller than those in silicon crystals.
"T" Line reference _____
"F" Corrected statement _____
e) Silicon dioxide is a very poor insulator.
"T" Line reference _____
"F" Corrected statement _____
f) Since silicon is a better heat conductor than gallium arsenide, tiny silicon devices could perhaps work as fast as those made of gallium arsenide.
"T" Line reference _____
"F" Corrected statement _____
g) More powerful supercomputers require faster semiconductor devices.
"T" Line reference _____
"F" Corrected statement _____
h) Increasing the speed of semiconductor devices also increases the amount of heat produced.
"T" Line reference _____
"F" Corrected statement _____

EXERCISE 3.

Contextual reference

With reference to the text, state what the following words refer to.

- a) they (line 4) _____
b) it (line 11) _____
c) them (line 9) _____
d) its (line 15) _____
e) whose (line 29) _____
f) it (line 32) _____
g) those (line 26) _____

EXERCISE 4.

Vocabulary study

Find synonyms and antonyms from the text for the following words.

Synonyms

- a) chief (para. 1) _____
b) and also (para. 1) _____
c) furthermore (para. 3) _____
d) notable (para. 3) _____
e) accumulation (para. 5) _____

Antonyms

- f) slightly (para. 4) _____
g) less (para. 5) _____
h) to slow down (para. 2) _____
i) narrow (para. 3) _____
j) inaccurate (para. 3) _____

EXERCISE 5.**Cloze test**

Fill in the gaps in the following version of the text using the following words:
**consequently, either, based, thereby, each, increasing, because,
recently, when, also, therefore**

Speed is of the utmost importance for new supercomputer technologies. Speed can be increased 1) _____ by making the devices smaller, 2) _____ reducing the distance for electrons to travel, or by 3) _____ the velocity of the flow of electrons through the device. Silicon is suitable for use in integrated circuits 4) _____ of its bandgap which is large enough over a wide temperature range. 5) _____, gallium arsenide has been used in semiconductor manufacturing because the electrons seem to be smaller 6) _____ traveling through the gallium arsenide crystal, 7) _____ increasing their speed. However, the speed of silicon devices can 8) _____ be increased by applying more power, due to their greater heat conductivity. 9) _____, the choice between silicon and the so-called faster material, gallium arsenide, must be 10) _____ on the advantages and disadvantages of 11) _____ material.

EXERCISE 6.**Sentence construction**

With reference to the text on "Semi-conductor materials", form a correct sentence from the following words or phrases, adding words if necessary.

- a) than gallium arsenide
silicon
has _____
better heat conduction
- b) excellent
silicon dioxide
is _____
insulator
- c) require faster
more powerful _____
semi-conductor devices
supercomputers
- d) in silicon crystals
appear to be smaller
electrons _____
than those
in gallium arsenide crystals
- e) also increases
of semi-conductor devices
quantity of heat produced _____
increasing the speed

f) distance

if semi-conductor devices
is shorter _____
a signal must travel _____
are smaller

EXERCISE 7.**Focus**

With reference to the previous text, find an example of the following grammatical forms. Give a numerical line reference.

- a) a modal or defective verb _____
- b) a gerund _____
- c) a present participle as adjective _____
- d) a past participle as adjective _____
- e) passive form _____
- f) word with noun forming suffix _____
- g) word with adjective forming suffix _____
- h) verb in conditional form _____

**GRAMMAR REVIEW**

progressive form
"ing" forms
modal verbs – must
conditional "if" clauses

STUDENT NOTES

Lesson 5

APPLICATIONS SOFTWARE

- (1) Applications programs can be held in backing store on a magnetic disc or tape. However, before a program can be put into operation it must first be loaded into the **RAM** area of the computer's main memory. This must be done each time a program is used. Alternatively, applications programs can be stored on **ROM** chips. These are plugged into sockets in the ROM area of the computer's main memory. Since the programs are resident in the main 5 memory, the user can put any program into operation immediately by inputting a special command.
- (2) Some applications programs are **command driven** and others are **menu driven**. When a command driven program is being executed, it is controlled by commands keyed in by the user. A menu driven program, however, displays a menu or list of choices on the screen. 10 The user controls the programs by choosing one item from the menu. This can be done by using the keyboard, a mouse, a light-pen or some other input device.
- (3) **Word processing programs** are used for the preparation and editing of letters and other documents. The text is keyed in using the keyboard but it is not printed onto paper directly. Instead, it is displayed on the screen and stored in the computer's memory. This allows the 15 text to be edited before it is printed out in its final form. As the text is being input, if there is not enough space left on a line to display the next complete word, it is automatically moved to the beginning of the next line. This **word-wrap** facility makes inputting a text much easier than using a typewriter where the typist has to judge when to begin a new line. Useful information, such as the number of words in the text, the amount of space remaining 20 in the memory and the typing speed, can be displayed on the screen while the text is being keyed in.
- (4) Various editing facilities are also available. After the cursor has been moved to the required position, characters can be deleted or inserted. When this happens, the rest of the text is automatically moved along the line to keep the spacing of the text correct. Other facilities 25 allow sections of the text to be moved or copied to another position without having to key in the characters again. There may also be a facility for the program to search for all the occurrences of a given word and replace it with another word. By inserting special command codes into the text (**embedded codes**), the user can control how it will be printed out, e.g. words may be underlined, printed in **bold** type or in **italics**. It may also be possible to 30 create an index by marking words with embedded codes. After the text has been keyed in, the program will automatically print out an index of the marked words and page references of where they occur in the text.
- (5) Some word processors have a built-in **spelling checker** which will compare words in the text with a dictionary of words in the computer's memory. If an unknown word or spelling 35 is found, it will be indicated to the user. When the text is complete, it can be permanently stored in a backing store. This allows the text to be used again at a different time without having to retype it. It may also be possible to merge two or more stored texts to give one longer text. The text can be printed out on paper using a printer. Before this is done, the user can determine the print layout. This includes deciding on such things as page 40

- numbering, line spacing, size of margins and **justification**, i.e. whether to have the left or right edge of the text straight.
- (6) **Mail merging** facilities combine a database with the word processor. This enables names and addresses stored in the database to be automatically inserted into the text. In this way, standard letters can be addressed to a number of different people. 45

False friends

editing (line 13) = revision/correction/modification of a text
 available (line 23) = furnished ready for use
 facilities (line 23) = capabilities, services
 to occur (line 33) = to be found
 to compare (line 34) = to make a comparison
 straight (line 42) = in a line/undeviating

Phrasal Verbs

to put into operation (line 6) = to start
 to key in (line 14) = to type on the computer's keyboard
 to move along (line 25) = to make space on a line



GRAMMAR NOTE

as = like (in comparisons), while (in time expressions - see line 16), since (in cause and effect expressions)

EXERCISE 1.

Matching information

Match the terms in Column A with the definitions in Column B.

COLUMN A

- 1) RAM
- 2) VDU screen
- 3) menu
- 4) to edit
- 5) ROM
- 6) command driven program
- 7) mail merging
- 8) menu driven program
- 9) word processor

COLUMN B

- a) a light sensitive device used to position the cursor or draw graphics
- b) program which requires the user to enter instructions at every stage
- c) program used to write and edit texts
- d) a collection of files in a structured form in a large memory
- e) a dictionary of correctly spelt words already held in the computer's memory
- f) read only memory
- g) enables the operator to key in continuously without

- _____ 10) light pen
- _____ 11) word-wrap facility
- _____ 12) database
- _____ 13) embedded codes
- _____ 14) spelling checker
- _____ 15) justification
- _____ 16) backing store
- indicating line endings
- h) random access memory
- i) the moving of characters to the left or right so that the lines have straight margins
- j) commands written in machine code to perform special printing functions such as italics or underlining
- k) program where commands are selected from a menu by the operator
- l) visual display unit
- m) a facility which allows a standard letter to be printed out in a series with different names and addresses
- n) a list of options available
- o) a separate secondary memory where permanent records can be kept
- p) to change, correct and modify text

EXERCISE 2.

Contextual reference

With reference to the text find out what the following words refer to:

- 1) it (line 2) _____
- 2) this (line 3) _____
- 3) these (line 4) _____
- 4) others (line 8) _____
- 5) this (line 11) _____
- 6) it (line 14) _____
- 7) it (the first, line 36) _____

EXERCISE 3.

Cloze test

Fill in the spaces in this brief summary of the text with the appropriate word:

this, which, can, of, in, to, be, than, as, of

Word processors allow texts 1) _____ be produced more quickly 2) _____ ordinary typewriters. Mistakes can 3) _____ corrected easily and even the final layout 4) _____ the text can be planned before printing. 5) _____ texts can be stored 6) _____ backing store, they 7) _____ be used again and again, 8) _____ avoids unnecessary work. In 9) _____ way, word processors simplify the work 10) _____ writing and editing texts.

EXERCISE 4.**Language study**

A. Fill in each space in this description with a suitable linking word from this list:
when, before, after, until, once, as, while

1) _____ a text is being keyed in, the screen displays the number of bytes remaining. The user can continue to input text no more space remains in the memory. 3) _____ this happens, more text is input.
2) _____ the text must be transferred to backing store 4) _____ the text has been completed, it printing, the user should decide on the layout. A spelling checker can be used to check for errors 7) _____ the final version is chosen and the spelling checked, the text can be printed out.

B. Now translate the following time sequence linkers into Italian, as they are used in the above text:

TRANSLATION

- a) when
- b) before
- c) after
- d) until
- e) once
- f) as
- g) while

EXERCISE 5.**Focus**

With reference to the text, match the following words in Column A with their grammatical functions in Column B:

COLUMN A

- a) backing (line 1) _____
- b) inputting (line 6) _____
- c) choosing (line 11) _____
- d) using (line 12) _____
- e) editing (line 18) _____
- f) inputting (line 21) _____
- g) typing (line 23) _____
- h) moved (line 23) _____
- i) required (line 23) _____
- j) printed (line 29) _____
- k) this (line 40) _____

COLUMN B

1. Demonstrative pronoun
2. Past participle as an adjective
3. Past participle in future passive form
4. Demonstrative adjective
5. Past participle in elliptical relative phrase
6. Present participle in progressive form
7. Present participle in elliptical relative phrase
8. Simple past tense
9. Gerund
10. Present participle as an adjective
11. Past participle in present perfect passive form

EXERCISE 6.**Question formation**

With reference to the text make questions to which the following sentences are the answers:

- 1) In backing store on a magnetic tape.
Where _____

2) Useful information such as the number of words in the text and the amount of space remaining in the memory.
What _____

3) A built-in spelling checker will.
What _____

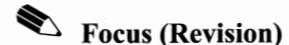
4) By using a printer.
How _____

EXERCISE 7.**Sentence formation**

Put the following sentence into the tenses and forms required:

A menu-driven program displays a list of choices

- a) Simple present interrogative _____
- b) Simple past negative _____
- c) Present perfect affirmative _____
- d) Future passive interrogative _____

EXERCISE 8.

Complete the following table with the proper form of the adjective.

COMPARATIVE

- a) easy
- b) complete
- c) speedy
- d) bold
- e) different
- f) long
- g) straight
- h) immediate
- i) fast

SUPERLATIVE

STUDENT NOTES

Lesson 6

COMPUTER VIRUSES

- (1) Computer programs are open to tampering or destruction by "hackers" (computer enthusiasts or, in some cases, computer vandals). Many of them try to access computers merely for the intellectual challenge of it - or just for fun. Others try to steal private data or malevolently implant "viruses" into software programs. A virus is generally a small software program that spreads through a personal computer memory and storage system, disrupting 5 programs and destroying information. As its name suggests, a virus can move from one computer or floppy disk to another. A virus can copy itself onto a computer's operating system, contaminate other floppy-disk programs and even damage an entire computer system.
- (2) Consequently, some firms are prohibiting the copying of so-called "public domain" software 10 (available to the public for free) onto their systems. Others are relying on a growing number of software products designed to prevent, detect and eliminate computer viruses. One company produces special "virus detector" software for IBM-compatible personal computers. The program is called Canary. When it is loaded into a computer, an image of the bird appears on the screen; if a virus is discovered, the on-screen canary will "die". 15 Users will then have to transfer all crucial data from the computer's storage system onto "clean" floppy disks, erase the contents of their hard-disk storage system, reload their data, and run the Canary test again.
- (3) A Swedish company says it has developed the first commercially available "vaccine" 20 against computer bugs. The program is named T-CELL, after the master coordinators of the human immune defense system. T-CELL makes the task of creating a virus so complicated that only vast computer systems would be able to penetrate its protective barrier. T-CELL vaccine itself cannot become infected by a bug, thus averting the possibility of a vaccine clone being created to counteract the program. T-CELL can also be used to detect systems that are already infected and to simplify reconstruction of a contaminated 25 system.
- (4) However, even with increasing security concerns, some people contend that the threat of computer contamination is overrated. In fact, if companies take a few precautions – among them using antivirus programs, copy-protection procedures and limiting the use of master disks – the likelihood of tampering can be significantly reduced.

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False friends

- open (line 1) = subject to
malevolently (line 4) = with an intense desire to cause damage
firms (line 10) = companies
for free (line 11) = without payment
after (line 20) = in allusion to the name of/in imitation of
to avert (line 23) = to prevent

Phrasal verbs

to rely on (line 11) = to be dependent on/to trust

EXERCISE 1.

Reading for main idea

Indicate which statement best expresses the **main idea** of the text. Use the following words to express why you eliminated the other choices: **not stated, false, detail**.

- a) Viruses are implanted into a computer's software by "hackers". _____
- b) Various software products are being developed to prevent, detect and eliminate computer viruses. _____
- c) The Canary "virus detector" has been developed for use in all computer systems. _____
- d) T-CELL vaccine is widely used in the Swedish aero-space industry. _____

EXERCISE 2.

Contextual reference

Refer back to the text and decide what the following words refer to.

- a) them (line 2) _____
- b) others (line 3) _____
- c) another (line 7) _____
- d) their (line 17) _____
- e) it (line 19) _____
- f) its (line 22) _____
- g) itself (line 23) _____
- h) them (line 29) _____

EXERCISE 3.

Vocabulary study

Find synonyms and antonyms from the text for the following words:

SYNONYMS

- a) to rob (paragraph 1) _____
- b) increasing (paragraph 2) _____
- c) essential (paragraph 2) _____
- d) yet (paragraph 4) _____

ANTONYMS

- e) public (paragraph 1) _____
- f) allowing (paragraph 2) _____
- g) easy (paragraph 3) _____
- h) underestimated (paragraph 4) _____

EXERCISE 4.

Reading for detail

Decide whether the following statements are true or false by referring to the text on "Computer Viruses". If TRUE, put a cross on "T" and give the **complete numerical line reference**; if FALSE, put a cross on "F" and **rewrite the statement given in the exercise to make it true**.

- a) A virus is generally a small computer system.

"T" Line reference _____

"F" Corrected statement _____

- b) A virus usually attacks a computer's hardware.

"T" Line reference _____

"F" Corrected statement _____

- c) All "hackers" who try to penetrate a computer system's software, do it for fun.

"T" Line reference _____

"F" Corrected statement _____

- d) The movement of a virus is not limited to one computer or floppy disk.

"T" Line reference _____

"F" Corrected statement _____

- e) Because of the risk of viruses, some companies do not allow the copying of "public domain" software onto their systems.

"T" Line reference _____

"F" Corrected statement _____

- f) Canary is a program which prevents computer viruses.

"T" Line reference _____

"F" Corrected statement _____

- g) T-CELL makes it extremely difficult for a virus to be implanted into a computer's software system.

"T" Line reference _____

"F" Corrected statement _____

- h) If there is a virus in an IBM compatible computer system, Canary is able to find it.

"T" Line reference _____

"F" Corrected statement _____

- i) T-CELL vaccine can be infected and duplicated in order to destroy the original program.

"T" Line reference _____

"F" Corrected statement _____

EXERCISE 5.**Word formation**

For a) to e) in Column A choose the meaning of the prefix from Column B and for f) to k) choose the part of speech indicated by the suffix from Column C

Column A	Column B	Column C
a) unintellectual	1) negative	A) noun
b) impersonal	2) positive	B) adjective
c) reconstruction	3) size	C) verb
d) predecessors	4) location	D) adverb
e) microcomputers	5) time and order	
f) prevention	6) number	
g) computerize		
h) commercially		
i) development		
j) available		
k) likelihood		

Now write the requested word form using the word given as the base:

- | | |
|-----------------|-------------------|
| a) to compute | (noun) _____ |
| b) tampering | (verb) _____ |
| c) enthusiasts | (adjective) _____ |
| d) merely | (adjective) _____ |
| e) intellectual | (adverb) _____ |
| f) to destroy | (adjective) _____ |
| g) to store | (noun) _____ |
| h) suggestion | (verb) _____ |
| i) entire | (adverb) _____ |
| j) compatible | (noun) _____ |

EXERCISE 6.**Cloze test**

Fill in the spaces with the appropriate word from the following list:
against, furthermore, stealing, complete, decrease, thereby, implanted, repair, stored, some, this, entire, careful, challenge

Computer viruses are 1) _____ into software programs by hackers either for 2) _____ private data or just for the 3) _____. The virus can tamper with or destroy 4) _____ information, and also contaminate a 5) _____ computer network. For this reason, 6) _____ companies do not permit the dubbing of—"public domain" software. In response to 7) _____ problem, the special "CANARY" program has been created to detect the possible presence of viruses and to clear up the 8) _____

computer system. As a preventive measure, the T-CELL "vaccine" 9) _____ computer bugs has been developed, 10) _____ immunizing computer systems. T-CELL is immune to viruses, so it cannot be infected and cloned. 11) _____, it can detect already contaminated systems and help to 12) _____ them. However, if companies are 13) _____ to use antivirus programs and copy-protection procedures, the possibility of tampering will 14) _____.

EXERCISE 7.**Sentence formation**

Put the following sentences into the simple past affirmative, interrogative and negative:

- a) A virus can copy itself onto a computer's operating system.

Simple past affirmative _____

Simple past negative _____

Simple past interrogative _____

- b) Users will then have to transfer all crucial data onto "clean" floppy disks.

Simple past affirmative _____

Simple past negative _____

Simple past interrogative _____

- c) Others try to steal private data.

Simple past affirmative _____

Simple past negative _____

Simple past interrogative _____

EXERCISE 8.**Question formation**

With reference to the text make questions to which the following sentences are the answers, using question words like **Who, What, Where, When**, etc:

- a) Hackers. ?

- b) Computer programs. ?

- c) Into software programs. ?

- d) For the intellectual challenge or for fun. ?

- e) An image of a bird appears. ?

- f) So complicated. ?

EXERCISE 9.

 **Conditional "IF" clauses**

The following are type 1 conditional sentences. Transform them into type 2 and type 3 conditionals:

a) If a virus is discovered, the on-screen canary will die. (Type 1)

Type 2 _____

Type 3 _____

b) If the size of a bandgap is too small, a small increase in temperature will send many electrons into the conduction band. (Type 1)

Type 2 _____

Type 3 _____

c) If a transistor becomes too small a lot of heat will accumulate inside the device. (Type 1)

Type 2 _____

Type 3 _____

d) If you leave your glasses on that chair, someone will sit on them. (Type 1)

Type 2 _____

Type 3 _____

Lesson 7

USER-FRIENDLY COMPUTERS

- (1) “There is zero doubt”, says Nick Donofrio, vice-president for development of IBM’s entry-systems division, “that the computers of the future will be more user-friendly”. In fact, as much as 50 percent of the added power of tomorrow’s computers will go to make the machines easier to use. The “graphical interface”, popularized by the Apple Macintosh (in which symbols such as a trashcan replace commands like “delete”), will become a standard 5 feature; chances are good that the once controversial “mouse” will also become the universal tool for navigating across the screen. Along with visual clues, computers almost certainly will also develop their own voices.
- (2) Chatty computers have been possible for years, but the technology has been expensive, the applications limited. With their new power, computers can now produce very pleasing 10 human voices and will probably be able to instruct new users by explaining complicated procedures. Computers will begin to understand speech as well. One of the best speech-recognition systems thus far, developed at Carnegie Mellon University, can understand about 1,000 words of English spoken by anyone. Talking computers may find their warmest welcome in university language labs. “My prediction”, says Frank Ryan of Brown 15 University’s language lab, “is that in no more than two years, all the grammar taught in our French classes will be taught by computer”. Language teachers can eventually expect to have computers that will read, with correct pronunciation, each sentence which a student types, even using Chinese or Russian characters.
- (3) Friendlier computers will transform elementary schools as well. At the Open School in 20 Los Angeles, an Apple-financed research project called Vivarium aims to make computers as natural a part of the curriculum as pencil and paper. Computers are recessed under the desks but are visible through transparent desktops - out of the way, yet always accessible. Kids use a program called Hypercard to take class notes, make drawings, do their homework, even create data bases on easy-to-use software.

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 **False friends**

along with (line 7) = together with

thus far (line 13) = up to now

eventually (line 17) = in the end

as well (line 20) (at the end of a sentence) = also

class notes (line 24) = a brief written summary of a lesson

EXERCISE 1.**Reading for main idea**

Based on the information in the text, provide an appropriate **main idea**. Then, give a **false statement**, a statement containing only a **detail**, and a phrase with a fact **not-stated** in the text.

- a) Main Idea _____
- b) False Statement _____
- c) Detail _____
- d) Not-stated _____

EXERCISE 2.**Vocabulary study**

Find synonyms and antonyms from the text for the following words:

SYNONYMS

- a) a characteristic (para.1) _____
- b) world-wide (para.1) _____
- c) finally (para.2) _____
- d) a forecast (para.2) _____

ANTONYMS

- e) taciturn (para.2) _____
- f) mistaken (para.2) _____
- g) vast (para.2) _____
- h) complex (para.3) _____

EXERCISE 3.**Cloze test**

Fill in the spaces with the following words:

introduced, talking, understand, but, found, making, become, include, speak,
discussed, schooling, financed, enthusiastic

A great deal of effort is going into 1) _____ modern computers more user friendly. Latest developments in this field 2) _____ the graphical interface pioneered by Apple Macintosh, the much 3) _____ "mouse" and the computer. Not only will these newest computers be able to 4) _____ to their users, 6) _____ some will also be able to 5) _____ human speech. The most 8) _____ users of 7) _____ these talking computers will probably be 9) _____ in university language labs. Elementary schools will benefit from friendlier computers too. In a project 10) _____ by Apple, computers have been 11) _____ into a Los Angeles school in the hope that they will eventually 12) _____ as basic a part of 13) _____ as pencil and paper.

EXERCISE 4.**Sequential order**

Put the following sentences into the correct sequential order according to the text.

- _____ a) One new speech-recognition system can understand words when they are spoken by anyone.
- _____ b) The "mouse" will gradually become a very common computer device.
- _____ c) Inexperienced users will be able to understand complicated computer procedures thanks to the computer's ability to explain these verbally.
- _____ d) Within two years, Brown University's language labs will probably teach all their French grammar using talking computers.
- _____ e) Talking computers were developed a long time ago.
- _____ f) Symbols will soon replace words in new graphical interfaces.
- _____ g) Some American children are already using computers at school.
- _____ h) Hypercard is a program to help school children.

EXERCISE 5.**Sentence formation**

Put the following sentence into the tenses and forms requested:

Kids use a program called Hypercard

- a) Simple present negative _____
- b) Simple past interrogative _____
- c) Present perfect affirmative _____
- d) Past perfect progressive interrogative _____
- e) Present progressive passive negative _____

EXERCISE 6.**Question formation**

With reference to the text make questions to which the following statements are the answers, using question words like **How long**, **What**, **Where**, **Why** and **Who**:

- a) He is the vice-president for development of IBM's entry-systems division.

- b) Chatty computers have been available for years.

- c) The once controversial "mouse" will.

- d) Computers are recessed under the desks.

- e) To make them out of the way yet always accessible.

EXERCISE 7.

 **Contextual reference**

Look back at the text and decide what these words refer to:

- a) their (line 10) _____
- b) their (line 14) _____
- c) that (line 18) _____
- d) their (line 24) _____

EXERCISE 8.

 **Focus**

With reference to the text, match the words or expressions in Column A with their grammatical functions in Column B.

COLUMN A

- 1. _____ talking (line 14)
- 2. _____ warmest (line 14)
- 3. _____ added (line 3)
- 4. _____ popularized (line 4)
- 5. _____ navigating (line 7)
- 6. _____ have been (line 9)
- 7. _____ can (line 17)
- 8. _____ taught (line 16)
- 9. _____ eventually (line 17)
- 10. _____ easier (line 4)

COLUMN B

- a) adverb
- b) past participle in elliptical form
- c) superlative form
- d) past participle in passive form
- e) present perfect tense
- f) gerund
- g) irregular verb
- h) modal verb
- i) present participle as adjective
- j) past participle as adjective
- k) comparative form
- l) simple past
- m) conditional form

 **GRAMMAR REVIEW**

- Present perfect tense
- "ed" forms
- "ing" forms
- future tense (3 types)

Lesson 8

COMPUTER DEVELOPMENTS

- (1) Much of the development of computers is due to the space program. The problems involved in controlling fleets of missiles are so huge that a massive research effort went into producing powerful computers to carry out the necessary calculations at the speed needed; eventually this effort also provided benefits in civilian life, such as weather forecasts which are produced with large 'supercomputers' and which benefit mineral and oil exploration, 5 airlines, the construction industry and many others dependent on different weather conditions.
- (2) The trend is to use this extra power to bring the computer closer to the user. Instead of programming computers in complex binary codes, programming languages have become closer to normal business or scientific language. A large part of the computer is taken up 10 with operating systems which, invisible to the users, translate their requests into the electronic logic which the computer understands. Other parts of the program turn the computer's results back into human readable form including attractive charts and graphs, as well as words. 'Fourth-generation languages' are already common; their main feature is their ability to produce 'user friendly software'. For example, it is unnecessary to search a 15 large database; the user merely specifies the layout of the database and the display desired, and the database management system does the rest. Other fourth-generation packages are available for designing spreadsheets (used for business planning and forecasting) and producing view-data screens and other applications.
- (3) The ultimate objective of much contemporary research is artificial intelligence - machines 20 which communicate with us in a natural language and can devise their own methods of solving problems instead of needing detailed programming.
- (4) The long-term outcome of these developments is that there will be no need for specialized programmers, except for a few engaged in systems design. Almost anyone will be able to produce software tailored to his own requirements. Even large companies will use local 25 networks for communication, eliminating the use of large mainframes.
- (5) Networking is gaining in popularity. In a network each terminal is a computer in its own right, often with as much memory as a mainframe which is different from simply connecting many keyboards to a terminal. Networking permits the sharing of expensive resources such as hard disks and printers and these networks can be also connected via 30 telecommunications to other local networks by means of satellites and telephone lines. Therefore, the members of an organization have the computing power necessary on their desks, with the ability to share databases and send reports rapidly via electronic mail. A separate computer department is no longer needed. Now, some microcomputers are capable of multitasking: a word processor can write a report, a graphics program can produce 35 diagrams, then the two are united to produce a high quality printout, all on one small computer with the aid of laser printers. This is known as desk top publishing.
- (6) In education too, the computer will bring profound changes. Computer databases can store far more information than one teacher could possibly know, so, most learning will take place via computer terminals. The nature of work has also undergone a revolution. Factories 40

will be partly staffed by robots; the employees will be concerned with supervising and programming the robots, not doing menial and repetitive production-line tasks. It will no longer be necessary to produce millions of identical products to justify the cost; articles can be tailored to the needs of people. More goods will be available than before although fewer people will be needed to produce them.

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False friends

eventually (line 3) = in the end
closer (adjective) (line 8) = nearer
as well as (line 14) = also
large (line 16) = big
ultimate (line 20) = final
education (line 38) = schooling/teaching
to take place (line 39/40) = to happen/to occur
factories (line 40) = workshops/manufactories

Phrasal Verbs

to go into (line 2) = to dedicate/to devote to
to carry out (line 3) = to execute/to perform
to be taken up with (line 10/11) = to be occupied by (space or time)
to turn something back into (line 12/13) = to re-transform
to be concerned with + gerund (line 41) = to be occupied/busy doing something



GRAMMAR NOTE

“Any” is usually used in interrogative and negative phrases, but when it is used in an affirmative phrase it means “qualunque” or “qualsiasi” (see “anyone” in line 24, which means “chiunque”)

EXERCISE 1.

Locating information

Find the passages in the text where the following ideas are expressed. Give a full numerical line reference.

- a) Specialized computer personnel will no longer be needed. _____
- b) Computers will aid in learning. _____
- c) Future computers will solve problems on their own, without instructions. _____
- d) Networking is not merely the sharing of one terminal. _____
- e) The development of space missiles required more sophisticated computers. _____
- f) Computers have become more user-friendly. _____

- g) Computers can now be used to send mail rapidly. _____
- h) At present, entire books can be published without leaving your desk. _____
- i) Robots will be used to perform menial, repetitive tasks. _____
- j) Thanks to computers, more products will be available for customers but made by fewer workers. _____
- k) Specialized programming languages are no longer necessary. _____

EXERCISE 2.

Vocabulary study

Find synonyms and antonyms from the text for the following words:

SYNONYMS

- a) in place of (para 2) _____
- b) advantages (para 1) _____
- c) general direction (para 2) _____
- d) furthermost (para 3) _____
- e) result (para 4) _____
- f) capacity (para 5) _____
- g) monotonous (para 6) _____

ANTONYMS

- h) tiny (para 1) _____
- i) military (para 1) _____
- j) slowly (para 5) _____
- k) simple (para 3) _____
- l) cheap (para 5) _____
- m) small (para 4) _____
- n) adding (para 4) _____

EXERCISE 3.

Sentence construction

Make complete sentences from the following series of words with reference to the text.
(You may need to add articles, auxiliary verbs etc.)

- a) space program, development, contributed, computers

- b) controls, hardware, operating system, functioning

- c) program, numbers, spreadsheet, columns

- d) computers, networking, two or more, interconnection

- e) weather, aiding, produce, supercomputers, industries, forecasts, construction

- f) program, allows, texts, word processor, which, editing

EXERCISE 4.

 **Punctuation**

Punctuate the following paragraph correctly.

Computers have made great advancements in recent years this is due to the space program which required complex calculations these advancements are now being utilised for everyday use in areas such as weather forecasting artificial intelligence desk top publishing and robot guided manufacturing furthermore the additional power of computers is being used to make them more user friendly this means that it is easier for the user to communicate with the machine in addition the software commands have been simplified education business offices manufacturing science will all profit from the further developments of computers the computer will become an even more indispensable part of modern life

EXERCISE 5.

 **Glossary**

Choose the correct term from the following list to fill in the blanks:

database, spreadsheet, operating system, multitasking, artificial intelligence, electronic mail, user friendly, networking, programming languages

- 1) Machines or robots with sensory capabilities that recognize sound and pictures are examples of _____.
- 2) Today messages are quickly sent and received electronically through _____.
- 3) I must access the _____ of my computer to find the data I need.
- 4) A _____ is a useful application for doing business calculations.
- 5) Computers have become simpler to use and so they are more _____.
- 6) The interconnecting of two or more computers either in the same room or in different buildings or towns allowing the exchange of information is known as _____.
- 7) _____ means that a computer system has the ability to run two or more programs simultaneously.
- 8) COBOL, FORTRAN and ALGOL are examples of _____.
- 9) The C.P.U, the input, output and secondary memory devices are controlled by the _____.

 **GRAMMAR REVIEW**

compound tenses
'ed' form
linking words

Lesson 9

OPTICAL COMPUTERS

- (1) "You can still say it's impractical, but you can't say anymore that it's impossible". Alan Huang, head of research at American Telephone and Telegraph Bell Laboratories, is talking about his passion - optical computers. The idea of building incredibly fast machines that compute with light pulses, called laser beams, instead of electrical signals, has been controversial for two decades, and scepticism still prevails. However, Huang feels that several recent breakthroughs will change people's minds. Bell Labs have already developed the first computer chip containing multiple optical switches or transistors known as SEEDS (Self Electro-Optic Effect Devices) and they will have an optical computer prototype by 2010.
- (2) Optical computers promise speeds which will be thousands, even millions of times faster than those of today's most efficient supercomputers. At these fantastic new speeds, computers could open the doors to new scientific discoveries and make possible the production of anything from new materials to sophisticated aircraft. These computers could also be crucial to our understanding of currently undecipherable codes and to the designing of superior nuclear weapons. As a senior Air Force official stated, "The optical computer could revolutionize computing in much the same way that the semiconductor chip revolutionized electronics 30 years ago".
- (3) Nevertheless, a commercial optical computer is a long way off. The optical transistors in the Bell Labs' integrated circuit, for example, are still roughly 100 times the size of their silicon counterparts. However, the AT&T scientists say that they will be able to reduce the size of the switches to 20 microns or less, and in ten years' time, an optical computer will fit into a brief-case. The reason that so much power can be crammed into so little space is that laser beams do not cause short circuits when they cross paths, thereby making it possible to process multiple streams of data at the same time. This means that in the field of telecommunications, for instance, a single optical chip will be able to handle the telephone calls of all the five billion inhabitants of the earth talking simultaneously.

 **False friends**

impractical (line 1) = not practical/ unadvantageous
decade (line 5) = ten years
currently (line 14) = at present
senior (line 15) = holding a high and authoritative position

 **GRAMMAR NOTE**

Words like **electronics, physics, mathematics** represent a singular scientific field, therefore the verb used is **singular**.

EXERCISE 1.

Reading for main idea

Indicate which statement best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not stated, false, detail**.

- a) Optical processing could radically improve future computing._____
- b) Computer researchers are thoroughly convinced about the use of laser beams in computers._____
- c) Optical computers could be used to manufacture nuclear weapons alone._____
- d) In ten years' time an optical computer will fit into a briefcase._____

EXERCISE 2.

Comprehension

Match the following words or phrases in Column A with the information in Column B.

COLUMN A

- a) _____ optical transistors
- b) _____ laser beams
- c) _____ SEEDS
- d) _____ optical computers
- e) _____ development of optical computer prototype
- f) _____ American Telephone and Telegraph Bell Company
- g) _____ approximately 20 microns

COLUMN B

- 1) no problems with short circuits
- 2) optical computer research
- 3) ultimate size of optical switches
- 4) 100 times size of silicon transistors
- 5) multiple optical transistors
- 6) 2010
- 7) computers with light impulses

EXERCISE 3.

Reading for detail

Decide whether the following statements are true or false by referring to the information in the text. If TRUE, put a cross "T" and give a full line reference; if FALSE, put a cross on "F" and rewrite the statement given in the exercise to make it true.

- a) Optical computers will be much faster than even today's most advanced computers.
"T" Line reference _____
"F" Corrected statement _____
- b) Ultimately, optical computers will be small enough to carry around.
"T" Line reference _____
"F" Corrected statement _____
- c) Optical computers will be able to handle multiple streams of data simultaneously.
"T" Line reference _____
"F" Corrected statement _____

- d) Laser beams replace electrical signals in optical computers.

"T" Line reference _____

"F" Corrected statement _____

- e) SEEDS are the multiple optical switches on the computer chip.

"T" Line reference _____

"F" Corrected statement _____

- f) An optical computer prototype will be produced by 2010.

"T" Line reference _____

"F" Corrected statement _____

- g) Laser beams cause short circuits when they cross paths.

"T" Line reference _____

"F" Corrected statement _____

- h) At present, optical transistors are 100 times smaller than their silicon counterparts.

"T" Line reference _____

"F" Corrected statement _____

- i) Huang states that new advances will convince people of the possibility of using laser beams in computers.

"T" Line reference _____

"F" Corrected statement _____

EXERCISE 4.

Word forms

Choose the appropriate form of the word to complete the sentence.

(You may need to add an 's' to a verb in the third person singular or to a plural noun)

- 1) change, changeable, changeably, changing, changed

a) Computer personnel often have to take refresher courses in the _____ field of computer science.

b) Many _____ have taken place in the computer industry in the last decade.

c) Memory and primary storage can be used inter-_____.

- 2) revolution, revolve, revolved, revolving

a) Certain impact printers have cylinders with the characters set on them which _____ in order to print a line.

b) In this process, one complete line of characters is printed during one _____ of the cylinder.

c) The entrance of the new computer center has a _____ door.

- 3) development, develop, developed, developing, developer

a) In 1960, the second generation of computers was _____.

b) The future will bring great _____ in the mechanical devices associated with computer systems.

c) _____ the chip made it possible for mini-computers and microcomputers to be invented.

- 4) electricity, electrical, electric, electrically

a) A lot of _____ is needed to operate large computer systems.

b) Many students today are studying to become _____ engineers.

EXERCISE 5.

Vocabulary building

With reference to the text, choose the word or phrases from the alternatives which is closest in meaning to the following words:

- | | | |
|---------------------------|----------------------|-----------------------------|
| a) breakthrough (line 6) | ii) a critical point | iii) a collapse |
| i) a sudden advance | | |
| b) roughly (line 19) | ii) approximately | iii) coarse |
| i) violently | | |
| c) counterpart (line 20) | ii) against the side | iii) the opposite direction |
| i) equivalent | | |
| d) fit (line 22) | ii) can be inserted | iii) to try on |
| i) suitable | | |
| e) paths (line 23) | ii) ways of life | iii) small roads |
| i) tracks | | |
| f) crammed (line 22) | ii) packed tightly | iii) set into |
| i) loosely packed | | |
| g) long way off (line 18) | ii) not far away | iii) next to |
| i) far away | | |

EXERCISE 6.

Verb forms

With reference to the text, put the verbs in parentheses into the correct tense.

- now _____ (consider) the use of laser beams to
- 1) Researchers _____ electrical signals. now _____ (consider) the use of laser beams to
 - 2) They believe an optical computer prototype _____ (be) ready by 2010.
 - 3) Some people are sceptical about the possibility of _____ (build) optical
 - 4) Some people's minds, however, _____ soon _____ (change) by recent
 - 5) SEEDS transistors _____ (contain) multiple optical switches.
 - 6) Optical computers _____ (can compute) faster and more efficiently than today's supercomputers.
 - 7) The field of electronics _____ (revolutionize) over 30 years ago thanks to the semi-conductor chip.
 - 8) Electrical signals _____ (not operate) as fast as light pulses.
 - 9) An optical computer will be able to _____ (place) in a brief-case.
 - 10) A vast number of telephone calls _____ (handle) by a single optical chip.

EXERCISE 7.

Question formation

With reference to the text, make sentences to which the following statements are the answers. Use question words like Who? When?, Where?, What?, Why? and How?.

1. Alan Huang.

2. It is optical computers.

3. By 2010.

4. In much the same way that the semiconductor chip revolutionized electronics.

5. Into a briefcase.

6. Because laser beams don't cause short circuits.

7. A single optical chip will.

8. They are roughly 100 times the size of their silicon counterparts.

STUDENT NOTES

Lesson 10

OPTICAL VERSUS SEMI-CONDUCTOR TECHNOLOGY

- (1) Regardless of the technology which a computer incorporates (be it optical or electronic) or the functions that it executes (be they multiplication or pattern recognition), two principal activities take place in it as it solves a problem: logic operations and data transmission. Viewing computation in such fundamental terms helps to get to the source of a particular computer technology's strengths and weaknesses. Semiconductor technology can be used to build sophisticated logic circuits from electronic switches of very small size that have very reliable characteristics. However, such integrated circuits are rather limited in the amount of data that can be transmitted among the circuit elements. The reason is that on a silicon chip, communication links consist of wires that must be kept separated by at least a minimum critical distance; otherwise the electrical signals, which they carry, interfere with one another. This practical restriction places an effective limit on the number of wires that can be placed on a chip and hence on the amount of data communication that can take place on the chip. 5
- (2) Is there another technology from which computers could be built that does not suffer from this limitation in data communication? The operation of the eye's lens suggests one. The lens takes light from each of millions of points entering the pupil and redistributes it to millions of sensors on the retina. It is in this sense that the lens can be thought of as a highly capable interconnection device: light from every point at the pupil is "connected" to every point in the image focused on the retina. In fact, modern communications make use of fibre optic cables, laser beams and other light sources to carry data in the form of pulses of light, because multiple beams of light can pass through lenses or prisms and still remain separate. Indeed, two beams of light, unlike a pair of current-carrying wires, can cross without affecting each other, thereby increasing the quantity of data that can be contained by a chip. It is this ability to establish an extensive communication network among processing elements that primarily distinguishes optical technology from semiconductor technology in its application to computation. 10 15 20 25

False friends

to take place (line 3) = to happen
logic operations (line 3) = logic procedures
the operation of the eye's lens (line 15) = the functioning of the eye's lens
to affect (line 23) = to influence

Phrasal verbs

to get to (line 4) = to arrive at/to reach
to think of (line 17) = to consider

**GRAMMAR NOTE**

Expressions like “**each other**” (lines 23) and “**one another**” (line 11) are connected with **reciprocal actions** between one or more people or things.

EXERCISE 1.**Reading for main idea**

Indicate which statement best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not-stated, false, detail**.

- a) Semiconductor technology can be used to construct sophisticated logic circuits from electronic switches. _____
- b) A lens allows beams of light to cross without affecting one another. _____
- c) Optical technology is an improvement over semi-conductor technology because it permits a more extensive communication network. _____
- d) There is no known limit to the number of wires that can be placed on a silicon chip. _____
- e) Neural computers may one day make it possible to solve random problems efficiently. _____

EXERCISE 2.**Reading for detail**

Decide whether the following statements are true or false by referring to the text on Optical vs Semiconductor Technology. If TRUE, put a cross on “T” and give a full numerical line reference; if “FALSE”, put a cross on “F” and rewrite the statement given in the exercise to make it true.

- a) On a silicon chip, communication links are formed by wires which cross each other.
“T” Line Reference _____
“F” Corrected Statement _____
- b) Optical technology and semiconductor technology can produce an equally extensive communication network.
“T” Line Reference _____
“F” Corrected Statement _____
- c) Logic operations and data transmission both take place as a computer solves problems.
“T” Line Reference _____
“F” Corrected Statement _____
- d) Light is redistributed to millions of sensors in the pupil of the eye.
“T” Line Reference _____
“F” Corrected Statement _____

- e) Unlike the wires on a chip, beams of light can cross and still remain separate.
“T” Line Reference _____

“F” Corrected Statement _____

- f) With optical technology, the data communication that takes place on a chip is restricted.

“T” Line Reference _____

“F” Corrected Statement _____

- g) Optical technology makes use of wires as communication links.

“T” Line Reference _____

“F” Corrected Statement _____

EXERCISE 3.**Contextual reference**

Look back at the text and find out what the following words refer to.

- a) it (line 1) _____
- b) it (line 2) _____
- c) they (line 2) _____
- d) that (line 6) _____
- e) they (line 10) _____
- f) one (line 15) _____
- g) it (line 16) _____
- h) its (line 26) _____

EXERCISE 4.**Linking words**

With reference to the text, Optical versus Semiconductor Technology, give the **function** and the **translation in context** of the following linking words.

TRANSLATION**FUNCTION**

- | | |
|---------------------------------|-----------------------|
| a) _____ as (line 3) | 1) giving example |
| b) _____ however (line 7) | 2) time sequence |
| c) _____ regardless of (line 1) | 3) listing |
| d) _____ thereby (line 23) | 4) cause and effect |
| e) _____ hence (line 12) | 5) contrast |
| f) _____ otherwise (line 10) | 6) definition |
| | 7) adding information |

EXERCISE 5.



Focus
With reference to the text, match the words or expressions in Column A with their grammatical functions in Column B.

- COLUMN A**
- 1) _____ multiplication (line 2)
 - 2) _____ logic operations (line 3)
 - 3) _____ sophisticated (line 6)
 - 4) _____ integrated (line 7)
 - 5) _____ transmitted (line 8)
 - 6) _____ circuit elements (line 8)
 - 7) _____ affecting (line 23)
 - 8) _____ eye's lens (line 15)
 - 9) _____ can (line 17)
 - 10) _____ built (line 14)
 - 11) _____ silicon chip (line 9)
 - 12) _____ data communication (line 15)
 - 13) _____ current-carrying (line 22)

COLUMN B

- a) defective verb
- b) noun-forming suffix
- c) nominal group
- d) past participle as adjective
- e) past participle in passive form
- f) gerund
- g) irregular verb
- h) present participle as adjective
- i) possessive case
- j) past participle in elliptical relative phrase
- k) present participle in progressive form

EXERCISE 6.



Cloze test
Fill in the gaps in the summary of the above text using the following words and expressions:
on the one hand, interfering, on the other hand, highly, from, hence, must, whatever, used, since, limited, so that, moreover

1) _____ technology a computer incorporates, it 2) _____ perform logic operations and data transmission. 3) _____, semiconductor technology can be 4) _____ to build sophisticated logic circuits, but such integrated circuits are 5) _____ in data transmission, 6) _____ the wires on a silicon chip must be kept separate 7) _____ they do not interfere with each other. 8) _____, optical technology works on a principle similar to that of the human eye; the eye's lens takes light 9) _____ many points in the retina. 10) _____, multiple beams of light can pass through a lens and still remain separate, or even cross, without 11) _____ with each other (unlike wires on a chip). 12) _____, the lens can be seen as a 13) _____ capable interconnection device.

EXERCISE 7.



Find synonyms and antonyms from the text for the following words:

- a) limitation (paragraph 1) _____
b) includes (paragraph 1) _____
c) mainly (paragraph 2) _____
d) maximum (paragraph 1) _____
e) simple (paragraph 1) _____
f) strengths (paragraph 1) _____

EXERCISE 8.



Put the following sentence into the tenses and forms requested:

Modern communications make use of fibre optic cables

- a) Simple present interrogative _____
b) Simple past negative _____
c) Simple future affirmative _____
d) Present perfect progressive affirmative _____
e) Future perfect interrogative _____
f) Past conditional negative _____
g) Past progressive passive affirmative _____

STUDENT NOTES

Lesson 11

SUPERCOMPUTERS

- (1) The term supercomputer has been more or less defined as pertaining to those machines that possess the enormous processing capabilities which are required for numerically intensive problems typically involving the simulation of complex systems or phenomena. These include weather prediction, nuclear research, structural engineering, and, in general, those problems that involve large matrix calculations.
5
- (2) Memory is a major factor in determining the performance of a supercomputer, and the speed at which a calculation is carried out is frequently dependent on the size of a given machine's memory banks. Bottlenecks often result from the sheer volume of data that must be manipulated. Indeed, moving large quantities of data from secondary storage to main memory and back again may be the most time-consuming aspect of any problem in 10 computation. Although supercomputer memories are growing at a rate comparable to computational power, in some cases this is still inadequate. The CDC7600 of the early 1970s had a memory capacity of 500,000 15-digit numbers. The Cray-S, built almost 15 years later, had a capacity 512 times greater: it could hold 256 million 15-digit numbers in its memory. But as calculations become increasingly complex, even a memory size of 15 several billion words may be insufficient for future computational needs. In order to tap a memory bank this large, extensive changes in software design may be necessary.
15
- (3) Today's supercomputers can provide the additional power for aerodynamicists to examine details of aerodynamic-flow patterns that are impossible to measure in a traditional wind tunnel and impracticable using traditional computers. Moreover, complex data entered 20 into a supercomputer can be converted into a three-dimensional graphics display at a workstation where it can be visualized from a variety of angles and perspectives. Wind-tunnel testing may indicate the presence of drag, but the computer can dissect its individual components and give precise information about their relative effects. For the first time computational analysis can provide information which physical experimentation cannot 25 offer.
20
- (4) Matching the capabilities of a supercomputer to the needs of a particular user is very important. For example, the peak speed of a supercomputer is of little relevance to an aerodynamicist measuring stress on the wing of an airplane: what matters to that user is the speed with which a complicated mathematical model of the wing can be created and 30 put through a series of stress tests. Therefore, the speed with which a computer can solve a complex problem, involving many variables, may be more important than how fast it can process a carefully constructed array of numbers. This is much like assessing the performance of a sports car over a winding mountain road compared with its peak speed on a straight, flat stretch of highway.
30

35

False friends

major (line 6) = important/principal

almost (line 13) = approximately
 to tap (line 16) = to extract something from a source/ access
 in order to (line 16) = to be able to
 to provide (line 18) = to give/supply
 drag (line 23) = resistance/impediment
 relevance (line 28) = in relation to/pertinence to the matter in hand
 winding (line 34) (from the verb to wind) = twisting/bendy

Phrasal verbs
 to put someone/something through a test (line 31) = to perform a test on that person/thing
 to carry out (line 7) = to execute/to perform

EXERCISE 1. **Reading for detail**

Decide whether the following statements are true or false by referring to the text on Supercomputers. If TRUE, put a cross on "T" and **give a full numerical line reference**; if FALSE, put a cross on "F" and **correct the statement given in the exercise** to make it true.

- a) Different users need to utilize different features of the supercomputer's capabilities
 "T" Line reference _____
 "F" Corrected statement _____
- b) Accessing the enormous memory banks of the supercomputers of the near future will present no problems.
 "T" Line reference _____
 "F" Corrected statement _____
- c) Physical experimentation is able to provide just as much information as computational analysis.
 "T" Line reference _____
 "F" Corrected statement _____
- d) The size of a computer's memory bank often regulates how fast calculations can be performed.
 "T" Line reference _____
 "F" Corrected statement _____
- e) It probably takes more time to transfer data to and from memory than for any other computing function.
 "T" Line reference _____
 "F" Corrected statement _____
- f) A wind tunnel can be used to measure the individual components of drag and give detailed information about its effects.
 "T" Line reference _____
 "F" Corrected statement _____
- g) An aerodynamicist is less interested in how fast a supercomputer can work than in how fast it can create a mathematical model of a wing under stress.
 "T" Line reference _____
 "F" Corrected statement _____

EXERCISE 2. **Vocabulary study**

Find synonyms and antonyms from the text for the following words:

SYNONYMS

- a) referring to (paragraph 1) _____
- b) important (paragraph 2) _____
- c) nearly (paragraph 2) _____
- d) is important (paragraph 4) _____
- e) models (paragraph 3) _____
- f) presentation (paragraph 3) _____
- g) coupling (paragraph 4) _____
- h) evaluating (paragraph 4) _____

ANTONYMS

- i) curvy (paragraph 4) _____
- j) minimum (paragraph 4) _____
- k) few (paragraph 4) _____
- l) decreasing (paragraph 2) _____
- m) absence (paragraph 3) _____
- n) unite (paragraph 3) _____

EXERCISE 3. **Contextual reference**

With reference to the text on supercomputers, find out what these words refer to:

- a) that (line 5) _____
- b) this (line 12) _____
- c) it (line 14) _____
- d) it (line 22) _____
- e) its (line 23) _____
- f) their (line 24) _____
- g) it (line 32) _____
- h) a memory bank this large (line 16/17) _____
- i) that user (line 29) _____

EXERCISE 4. **Sentence formation**

Put the following sentence into the tenses and forms requested:

Scientists built the CDC7600 in the 1970s

- a) Simple past interrogative _____
- b) Past perfect negative _____
- c) Future progressive affirmative _____
- d) Past conditional interrogative _____
- e) Present perfect passive affirmative _____

EXERCISE 5.

 Word forms

Choose the correct form of the word to complete the following sentences (you may need to add an "s" to a plural noun or to the third person singular of a verb):

- 1) determine, determining, determination, determined
 - a) The performance of a computer is, to a great extent, _____ by its memory capacity.
 - b) She showed great _____ in her work.
 - c) Memory is a major factor in _____ the performance of computers.
- 2) required, require, requirement, requiring
 - a) He did not have the necessary _____ for the university.
 - b) Increasingly complex calculations _____ increasingly large memory sizes.
 - c) Many problems in Artificial Intelligence _____ considerable search capabilities.
- 3) Causing, cause, caused
 - a) The amount of data often _____ bottlenecks.
 - b) Dust and dirt _____ the condition of disks to deteriorate.
- 4) Measure, measurement, measuring, measurable, measured
 - a) The work of an aerodynamicist often involves _____ stress on a wing.
 - b) The analog computer is used essentially for problems involving _____.
 - c) The density of a tape is _____ in bytes per inch.

Lesson 12

ADVANCED COMPUTER ARCHITECTURES

- (1) Most computers have a single processor, which is the unit that does the computational work such as addition, multiplication or the comparison of two numbers. Programmers divide each computational task into a sequence of steps - a program - and the computer's processor executes the sequence one step at a time. This approach is inherently slow because much of the processor is idle while one step is being performed. Designers of advanced computer architectures are developing approaches that overcome these sources of slowness. For example, they are devising ways to increase the speed of a single processor by keeping all the processor's components active.
- (2) How might one improve the speed of a single processor? A major source of slowness involves access to memory. If data or instructions need to be fetched from a memory bank before a certain computation can take place, all the processor's functional units must remain idle while the memory cycles. The solution to this problem has been to design machines in which, while one operation is being executed, the next set of instructions is fetched from memory and divided into operations that can be done by the various functional units. Access to memory can also cause bottlenecks which can be resolved by a system known as interleaved memory. An interleaved memory typically consists of a small number of separately accessible memory units in which data can be operated on simultaneously.
- (3) Another source of slowness lies in the actual process of computation. Arithmetic operations can require many small steps. When a processor multiplies two floating-point numbers (numbers that are not necessarily integers), it must first split each number into an exponent and a mantissa (as in scientific notation), then add the exponents, then multiply the mantissas (an operation that in itself can require a large number of steps) and finally express the new product in scientific notation. The functional unit which does floating-point multiplication can be split into segments, each of which executes one of these tasks. Thus in a simple processor, all but one of the segments must be idle at any given time, representing a great waste of computing power.
- (4) Pipelining, which might be one solution to this problem, can speed up the operation of a single processor and is analogous to the operation of an automobile assembly line. Each computational step is done by a different component of the processor. In a conventional processor (a), while one component executes its task, the others are idle. In the example, the task is multiplying two numbers, and the steps are: 1) extracting each number's exponent and mantissa, 2) adding the exponents, 3) multiplying the mantissas, and 4) expressing the product in scientific notation. In an assembly line (b) no assembly station is idle; as soon as a step has been completed on one car and that car has been moved along the line, the next car is moved into the station. Thus several operations are performed at once on different cars. A pipelined processor (c) operates in much the same way; after an operation has been done on one pair of numbers, another pair is brought in to have the same operation done on it, without waiting for the first pair to undergo every stage of the computation.

 **False friends**

inherently (line 4) = characteristically/typically
 to devise (line 7) = to invent/create
 actual (line 18) = real/effective
 a waste (line 26) = when something is not used to its full capacity
 at once (line 35) = at the same time/simultaneously

Phrasal verbs

to operate on data (line 17) = to process data
 to speed up the operation (line 27) = to make the operation faster
 to bring in (lines 37) = to introduce
 to wait for someone/something (line 38) = to await/expect someone/something

**GRAMMAR NOTE**

to lie (irregular, intransitive verb: to lie-lay-lain) = giacere;
 to lie (regular intransitive verb: to lie-lied-lied) = mentire;
 to lay (irregular, transitive verb: to lay-laid-laid) = porre/deporre

EXERCISE 1.
Reading for detail

Find the lines in which the following ideas are expressed in the text on Advanced Computer Architectures.

Give a complete numerical line reference.

- Only one part of the unit doing computation can work at one time in a conventional processor.
 Line reference _____
- When computation is carried out in a simple processor, each part of the functional unit carries out a specific step.
 Line reference _____
- Computational slowness can be overcome by utilizing all components of the processor.
 Line reference _____
- “Pipelining” means that new numbers can be taken into the processor before the operations have been completed on the previous ones.
 Line reference _____
- The concept of pipelining in a processor is the same as in assembling cars.
 Line reference _____
- An interleaved memory has separate memory units which can be interrogated simultaneously.
 Line reference _____

- A great deal of computing potential is lost due to the inability of a simple processor's components to work contemporaneously.

Line reference _____

- When cars are assembled, all the assembly stations work at the same time.

Line reference _____

- All functional units must remain inactive while instructions are being taken from the memory bank.

Line reference _____

- Conventional computer processors are slowed down by all the various steps required for calculations.

Line reference _____

EXERCISE 2.
Focus

Find examples of the following grammatical forms from the text and **give a numerical line reference**:

- Present perfect tense _____
- Present progressive passive form _____
- Irregular verb _____
- Relative pronoun _____
- Defective (modal) verb _____
- Present participle as adjective _____
- Present progressive tense _____
- Gerund _____
- Present passive form _____
- Past participle as adjective _____

EXERCISE 3.
Contextual reference

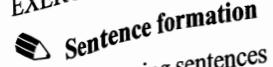
With reference to the text on Advanced Computer Architectures, find out what these words refer to:

- it (line 20) _____
- itself (line 22) _____
- each (line 24) _____
- each (line 28) _____
- it (line 38) _____
- which (line 1) _____
- this problem (line 12) _____

EXERCISE 4.

Cloze test
Fill in the gaps in the following version of the text on Advanced Computer Architectures using the following words:
first, increasing, lastly, either, for example, single, second, each, immediately, simultaneously, begun, then, can, place, however, following

The speed of a computer 1) _____ be increased by keeping all the processor's components active. The velocity of a 2) _____ processor can be accelerated by improving the access to the memory bank. Arithmetic operations, 3) _____ by hand or with the use of a computer, can be slow and require many steps. When multiplying two floating-point numbers, first one must divide the number into mantissa and exponent, 4) _____, add the exponents, 6) _____ multiply the mantissas and 5) _____, express the product in scientific notation. In a computer, the functional unit of the processor which carries out the multiplication can be divided into segments, 7) _____ segment performing one of the operations. This means that, in a simple 8) _____ processor, only one segment is working at a time. Pipelining is a way of 9) _____ the speed of a processor and can be compared to the operations of an automobile assembly line. When one step has been completed on a car, it is 10) _____ moved along the line and another car takes its 11) _____. In a similar manner, when processing has cars 12) _____ on one pair of numbers, another pair is brought in without waiting for 13) _____ the execution of all operations on the 14) _____ pair.

EXERCISE 5.

Sentence formation
Put the following sentences into:

- the simple present interrogative
- the simple present negative
- the simple past affirmative

1. Programmers divide each computational task into a sequence of steps.

- _____
- _____
- _____

2. Another source of slowness lies in the actual process of computation.

- _____
- _____
- _____

3. It must split each number into an exponent and a mantissa.

- _____
- _____
- _____

4. The next car is moved into the station.

- _____
- _____
- _____

b) _____
c) _____

5. A pipelined processor operates in a similar way to an assembly line.

- _____
- _____
- _____

6. Pipelining can speed up the operation of a single processor.

- _____
- _____
- _____

7. Several operations are performed at once on different cars.

- _____
- _____
- _____

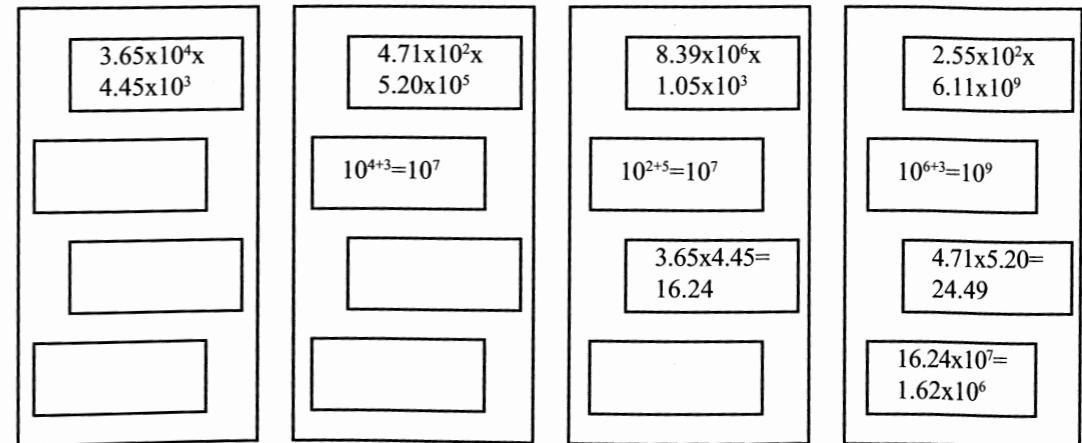
8. A processor multiplies two floating-point numbers.

- _____
- _____
- _____

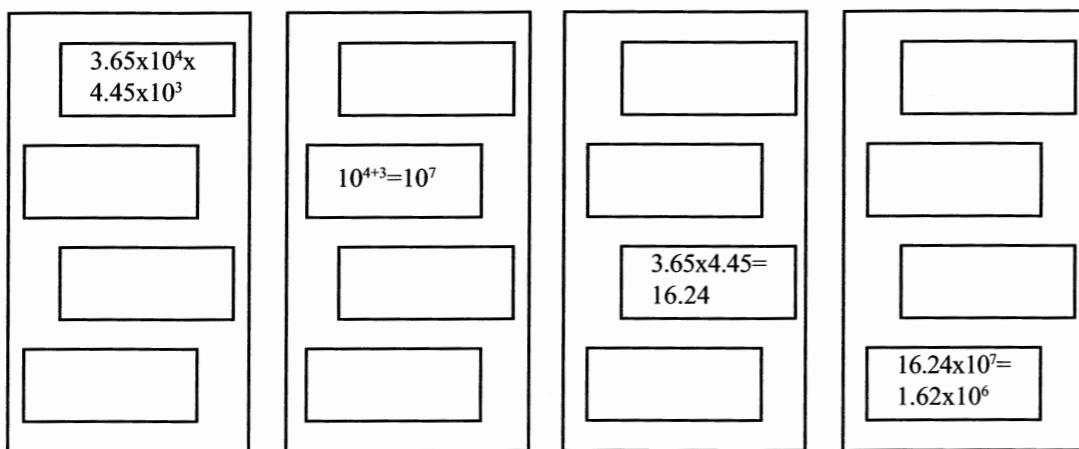
EXERCISE 6.

Match the descriptions of operations a), b), and c) in the text to the following 3 diagrams by simply putting the letters in the space to the left of each diagram.

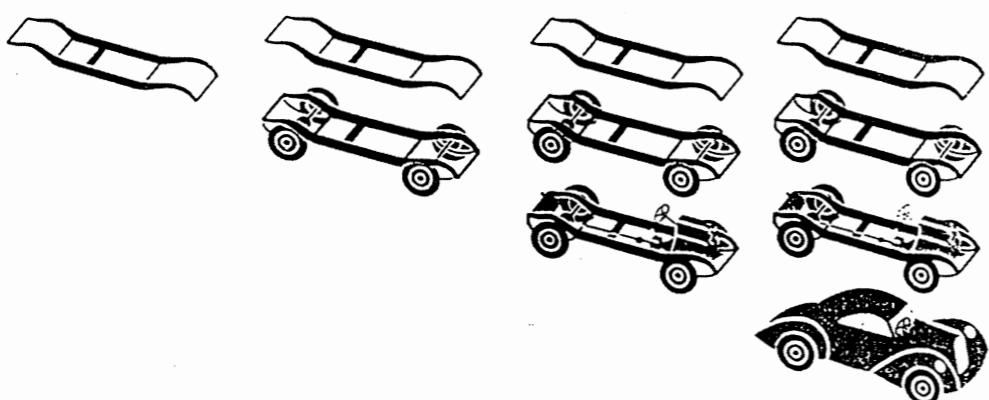
1) _____



2) _____



3) _____



Lesson 13

PROTEIN-BASED COMPUTERS

- (1) The world's most advanced "supercomputer" does not require a single semiconductor chip. The human brain consists of organic molecules that combine to form a highly sophisticated network able to calculate, perceive, manipulate, self-repair, think and feel. Digital computers can certainly perform calculations much faster and more precisely than humans. Computer designers may never be able to make machines having all the faculties 5 of the human brain, but many of them think they can exploit some special properties of biological molecules - particularly proteins - to build computer components that are smaller, faster and more powerful than any electronic devices on the drawing boards thus far.
- (2) The size issue is especially pressing. Since the 1960s the computer industry has been compelled to make individual components on semiconductor chips smaller and smaller in 10 order to manufacture larger memories and more powerful processors. The chips essentially consist of arrays of switches, usually of the kind known as logic gates, that flip between two states - designated as 0 and 1 - in response to changes in the electric current passing through them. If the trend toward miniaturization continues, the size of a single logic gate will approach the size of molecules by about the year 2030. 15
- (3) Molecules can potentially serve as computer switches because their atoms are mobile and change position in a predictable way. If one can direct that atomic motion and thereby consistently generate at least two discrete states in a molecule, each state can be used to represent either 0 or 1. Such switches offer reductions in the size of hardware because they themselves are small - about one thousandth the size of the semiconductor transistors used 20 today as gates. In the computer business, smaller gate size generally makes for a faster device, and protein-based computers could theoretically operate a thousand times faster than modern computers. At this stage no one is seriously proposing a purely biomolecular computer. Far more likely, at least for the near future, is the use of hybrid technology in which molecules and semiconductors are used in combination. 25
- (4) Biological molecules also appeal because they can be designed one atom at a time - giving engineers the control they need to manufacture gates able to perform exactly as an application requires. Researchers have introduced parallel-processing architectures, which allow multiple sets of data to be manipulated simultaneously. In order to expand memory capacities, they are devising hardware that stores data in three dimensions instead of the 30 usual two. Scientists have built neural networks that mimic the learning-by-association capabilities of the brain, an ability necessary for progress in artificial intelligence. The ability of certain proteins to change their properties in response to light should simplify the hardware required for implementation of these architectures.
- (5) Although no computer components made entirely or partly from proteins are on the market 35 yet, ongoing international research efforts are making exciting headway. Liquid-crystal display technology offers a prime example of a hybrid system that has achieved commercial success. Most laptop computers today depend on liquid-crystal displays, which combine semiconductor devices and organic molecules to control the intensity of the image on the screen. 40

- (6) Several biological molecules are under consideration for use in computer hardware, but the bacterial protein, "bacteriorhodopsin", has generated the most interest. During the past 10 years, prototype parallel-processing devices, three-dimensional data storage hardware and neural networks based on this protein have been built.

False friends

thus far (line 8) = up to now
consistently (line 18) = constantly/uniformly
likely (line 24) = probable

to appeal (line 26) = to be of interest
in order to (line 29) = with the aim of
prime (line 37) = excellent/top quality

Phrasal verbs

to make for (line 21) = to mean/to imply/to result in

EXERCISE 1.

Reading for detail

Indicate whether the following statements are true or false by referring to the text on Protein-based computers. If TRUE, put a cross on "T" and give a **full numerical line reference**; if FALSE, put a cross on "F" and **rewrite the statement given in the exercise** to make it true.

- a) Hybrid technology could serve as a transition to completely biomolecular devices.
"T" line reference _____
"F" corrected statement _____
- b) Chips are composed of switches which represent one of two states: 0 or 1.
"T" line reference _____
"F" corrected statement _____
- c) The human brain can perform all calculations better and faster than digital computers.
"T" line reference _____
"F" corrected statement _____
- d) An example of a hybrid computer system is the liquid crystal display, which combines semiconductor technology and inorganic molecules.
"T" line reference _____
"F" corrected statement _____
- e) Future computers will certainly have all the capabilities of the human brain.
"T" line reference _____
"F" corrected statement _____
- f) Since biomolecular computers will have smaller gates than semiconductor computers, they will theoretically be faster.
"T" line reference _____
"F" corrected statement _____

EXERCISE 2.

Reading for main idea

Indicate which idea best expresses the **main idea** of the text? Explain why you eliminated the other choices using the words: **not-stated, false, detail**.

- a) Soviet scientists were the first to recognize and develop the potential of bacteriorhodopsin for computing. _____
b) An exclusively biomolecular computer will be commercially available in the near future. _____
c) Devices fabricated from biological molecules promise more compact, faster and more powerful computers than those currently in use. _____
d) A liquid-crystal display is an example of a hybrid technology involving both organic molecules and semiconductors. _____
e) To improve memory capacities, hardware is being devised that stores data in two dimensions. _____

EXERCISE 3.

Question formation

The following statements are answers to questions regarding Protein-based computers. Formulate suitable questions for these answers, using question words like Who, what, why, where, how, when or a simple interrogative:

- a) Because their atoms are mobile and change position in a predictable way.

- b) It is an architecture which allows multiple sets of data to be manipulated simultaneously.

- c) No, they aren't on the market yet.

- d) By means of hardware that stores data in three-dimensions instead of two.

- e) The size of a single logic gate will approach the size of molecules by about the year 2030.

EXERCISE 4. **Contextual reference**

Look back at the previous text and decide what these words refer to.

- a) their (line 16) _____
- b) themselves (line 20) _____
- c) which (line 28) _____
- d) they (line 30) _____
- e) which (line 38) _____
- f) this protein (line 44) _____

EXERCISE 5. **Vocabulary building**

With reference to the text, choose the appropriate definition of the following words:

- | | | | |
|-----------------------|-----------------|----------------|------------------|
| a) array (line 12) | i) apparatus | ii) series | iii) arrangement |
| b) yet (line 36) | i) up to now | ii) soon | iii) however |
| c) since (line 9) | i) consequently | ii) previously | iii) after |
| d) pressing (line 9) | i) urgent | ii) pushing | iii) printing |
| e) issue (line 9) | i) edition | ii) time | iii) problem |
| f) although (line 35) | i) moreover | ii) but | iii) even if |
| g) exploit (line 6) | i) explore | ii) utilize | iii) eliminate |
| h) headway (line 36) | i) progress | ii) main road | iii) detail |
| i) achieved (line 37) | i) lost | ii) obtained | iii) avoided |

EXERCISE 6. **Focus**

With reference to the text, match the following words in Column A with their grammatical functions in Column B.

COLUMN A

- a) _____ most advanced (line 1)
- b) _____ having (line 5)
- c) _____ introduced (line 28)
- d) _____ proposing (line 23)
- e) _____ used (line 18)
- f) _____ learning (line 31)
- g) _____ during (line 42)
- h) _____ designed (line 26)
- i) _____ sophisticated (line 3)
- j) _____ should (line 33)

COLUMN B

- 1. past participle in elliptical relative phrase
- 2. comparative form of adjective
- 3. superlative form of adjective
- 4. gerund
- 5. nominal group
- 6. defective verb
- 7. past participle in present perfect tense
- 8. past participle in passive form
- 9. present participle in progressive form
- 10. present participle in elliptical relative phrase
- 11. past participle as adjective
- 12. present participle as adjective
- 13. preposition

EXERCISE 7. **Sentence formation**

Put the following sentences into:

- a) Simple past affirmative
- b) Simple past interrogative
- c) Present conditional

1. Digital computers can perform calculations much faster and more precisely than humans.

- a) _____
- b) _____
- c) _____

2. The size issue is especially pressing.

- a) _____
- b) _____
- c) _____

3. Most laptop computers depend on liquid-crystal displays.

- a) _____
- b) _____
- c) _____

STUDENT NOTES

Lesson 14

COMPUTER NETWORKING

- (1) The origins of computer networking can be traced to the development of the first time-sharing computers in the early 1960s, a time when computers were expensive and scarce. The idea behind time-sharing is simple. As many tasks, notably program development and debugging, require only a small fraction of the capacity of a large computer, it makes economic sense for the computer to serve not just one user at any one time, but many. This 5 objective can be achieved by switching among many user programs. The switching is managed by a program called an operating system which is an internal program controlling the functioning of the computer.
- (2) From time-sharing to networking was a short intellectual step. Once it had been shown that a relatively small group of users could share a single computer, it was natural to ask 10 whether a large, scattered community of workers could share the resources - data bases and even specialized programs - available on their respective time-sharing computers.
- (3) The design of the network depends on the distances involved, the type of devices to which 15 it will be connected and the applications to be supported. Local-area networks have become extremely popular of late. They connect two or more computers that typically are in a single building or are grouped in a single setting. Not only do they allow members of the same organization to send messages to one another and to access the same data bases and programs, but they also allow different workstations to share such expensive equipment as storage facilities and printers, whose cost has not fallen as rapidly as the cost of computers themselves. It is estimated that several hundred thousand local-area networks have been 20 installed world-wide. The two most common local-area network technologies are the ring and the tree. The first is made of a co-axial cable to which computers are connected one after another in a circle. The second is a broadcast network: data are transmitted along a single output line from which other lines branch out feeding individual stations.

False friends

scarce (line 2) = rare, few
notably (line 3) = in particular
available (line 12) = ready for use
design (line 13) = basic plan, project, structure
of late (line 15) = recently
facilities (line 19) = services/possibilities



GRAMMAR NOTE

The auxiliary verb "do", "does" and "did" is sometimes used in the affirmative phrase to give added emphasis, as in lines 16 to 18 in the text.

EXERCISE 1.

 **Reading for main idea**

Indicate which phrase best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not-stated**, **false**, **detail**.

- a) Networking design depends exclusively on the distances between various computer terminals. _____
- b) The cost of storage facilities and printers has decreased less than the cost of computers. _____
- c) Networking enables expensive computer resources to be shared by a large group of workers. _____
- d) Two network technologies are the ring and the tree. _____

EXERCISE 2.

 **Contextual reference**

Look back at the text and find out what these words refer to:

- a) many (line 5) _____
- b) which (line 7) _____
- c) their (line 12) _____
- d) first (line 22) _____
- e) second (line 23) _____
- f) they (line 15) _____

EXERCISE 3.

 **Reading for detail**

Decide whether the following statements are true or false by referring to the text on "Computer Networking". If TRUE, put a cross on "T" and **give a full numerical line reference**; if FALSE, put a cross on "F" and **rewrite the statement given in the exercise** to make it true.

- a) It is thought that several hundred thousand local-area networks exist in the United States.
"T" Line reference _____
"F" Corrected statement _____
- b) The ring technology consists of a single output line with other lines branching out.
"T" Line reference _____
"F" Corrected statement _____
- c) A broadcast network makes use of a co-axial cable to connect computers.
"T" Line reference _____
"F" Corrected statement _____
- d) Debugging requires a large part of memory capacity.
"T" Line reference _____
"F" Corrected statement _____
- e) The idea of time-sharing computers did not even exist in the early 1960s.
"T" Line reference _____

"F" Corrected statement _____

f) Local-area networks have always been extremely popular.

"T" Line reference _____

"F" Corrected statement _____

g) Computers using the concept of time-sharing were first developed when the cost of computers was high.

"T" Line reference _____

"F" Corrected statement _____

EXERCISE 4.

 **Focus**

Find an example of the following grammatical forms from the above text.
Give a numerical line reference.

- a) Gerund _____
- b) Passive form _____
- c) Present perfect tense _____
- d) Defective/modal verb _____
- e) An adjective-forming suffix _____
- f) A noun-forming suffix _____
- g) Past participle used as adjective _____
- h) Present participle in elliptical relative phrase _____

EXERCISE 5.

 **Cloze test**

Fill in the gaps in the following version of the previous text using the following words:
local, means, expensive, kind, basis, not only, design, same, networking, but also, circle, feeding, ring, over

The concept of time-sharing was the 1) _____ of the development of networking. Time-sharing 2) _____ that a large number of users can use a single computer at the same time. This led to the idea that perhaps a greater number of users could 3) _____ share the time, 4) _____ the data bases and specialized programs available on the 5) _____ computer. The networking 6) _____ depends on distance, the type of programs to be processed, and the 7) _____ of devices to which they are linked. To date, several hundred thousand 8) _____ area networks have been installed all 9) _____ the world allowing both easy communication between members of the same organization and the communal use of 10) _____ peripheral equipment. Technologies used in 11) _____ include the tree (using a single output line with branch lines 12) _____ separate stations) and the 13) _____ which uses a co-axial cable to which computers are linked in a 14) _____ .

EXERCISE 6.

 Sentence formation

Put the following sentence into the tenses and forms requested:

Debugging requires only a small fraction of a computer's capacity

- a) Simple present negative _____
- b) Simple past interrogative _____
- c) Present perfect progressive affirmative _____
- d) Past perfect interrogative _____
- e) Past perfect Passive affirmative _____

EXERCISE 7.

 Word formation

Match the words with the suffixes in bold type in Column A with the correct part of speech in Column B:

COLUMN A

- a) expensive (line 2) _____
- b) notably (line 3) _____
- c) capacity (line 4) _____
- d) economic (line 5) _____
- e) user (line 6) _____
- f) internal (line 7) _____
- g) available (line 12) _____
- h) organization (line 17) _____
- i) equipment (line 18) _____

COLUMN B

- A. NOUN
- B. ADJECTIVE
- C. VERB
- D. ADVERB

Lesson 15

SEARCHING THE INTERNET

- (1) One way of organizing the mass of information on the Internet is to classify all the data into indexes, as in a traditional library. In theory, software, which automatically classifies and organizes the collections of digital data into indexes, can control the enormous amounts of information on the Net that human indexers find difficult to manage. Automating the access to information has the advantage of directly utilizing the increasingly lower costs 5 of computers and avoiding the high expense and slowness of human indexers. But, as anyone who has ever looked for information on the Web knows, these automated tools categorize information differently than people do. Machine-based approaches provide uniform and equal access to all the information on the Net. In practice, this electronic "democracy" can prove to be a problem. Web surfers who key in a request for information 10 are often surprised by the thousands of responses they receive. The responses frequently contain references to irrelevant Web sites, but omit others which contain important information.
- (2) The nature of electronic indexes can be understood by examining the way that the Web search machines, such as Yahoo or Alta Vista, create indexes and find information requested 15 by a user. Periodically, they send programs (sometimes referred to as web crawlers, or indexing robots) to every site they can identify on the Web - each site being a set of documents, called pages, that can be accessed over the network. The Web crawlers download and examine these pages, extract the information that can be used to index them and store the data in the search machine's database. A user then utilizes a browser, such as the 20 familiar Netscape, to present queries to the search machine's database. The query produces the list of Web resources identified by the search.
- (3) Existing search machines respond to millions of queries a day. Yet it has become clear that they are not ideal for retrieving the increasing amount of information on the Web. In contrast to human indexers, automated index programs have difficulty identifying 25 characteristics of a document, such as its main idea or its genre – whether it is a poem, a biography, or even a newspaper article.
- (4) Moreover, the Web still has no basic standards that would facilitate automated indexing. In fact, the structure of Web documents does not permit the Web crawler to reliably extract typical information which a human indexer would rapidly find, such as author, date of 30 publication, length of text and subject matter. A Web crawler may find the desired article written by a certain author, but it might also find thousands of other articles in which that author's name is mentioned in the text or bibliographic reference.
- (5) Researchers are now trying to find suitable solutions to these disadvantages of the Net.

False friends

library (line 2)= a room where books are kept for consultation
irrelevant (line 12) = not pertinent

Phrasal verbs

to look for (line 7) = to search for



GRAMMAR NOTE

“yet” is a linking word when it is used at the beginning of an affirmative sentence or phrase to mean “however” (see line 23)

EXERCISE 1.



Reading for main idea

Indicate which phrase best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not-stated, false, detail**.

- a) Automated information indexing is highly superior to human indexing.
- b) Even though it is cheap and fast, automated indexing presents several problems which must still be resolved.
- c) Some research efforts try to attach metadata to files to facilitate automated indexing.
- d) The use of human indexers is more expensive and slower than automated access to information.

EXERCISE 2.



Reading for detail

Decide whether the following statements are true or false by referring to the text on “Searching the Internet”. If TRUE, put a cross on T and **give a complete numerical line reference**, if FALSE, put a cross on F and **correct the statement given in the exercise to make it true**.

- a) It is cheaper and faster to utilize automated indexing instead of human indexers.
“T” Line reference _____
“F” Corrected statement _____
- b) A browser is used to respond to queries from the search machine’s database.
“T” Line reference _____
“F” Corrected statement _____
- c) The democratic access to information on the Net is a great advantage.
“T” Line reference _____
“F” Corrected statement _____

- d) Both the Internet and traditional libraries need to index data.
“T” Line reference _____

“F” Corrected statement _____

- e) A human indexer is capable of defining the type of text he/she is examining.
“T” Line reference _____
“F” Corrected statement _____

EXERCISE 3.



Word formation

For the following words in Column A, choose the part of speech indicated by the **suffix** from Column B:

COLUMN A

- _____ a) traditional (line 2)
- _____ b) slowness (line 6)
- _____ c) categorize (line 8)
- _____ d) electronic (line 14)
- _____ e) crawlers (line 16)
- _____ f) facilitate (line 28)
- _____ g) reliably (line 29)
- _____ h) suitable (line 34)

COLUMN B

- A) NOUN
- B) ADJECTIVE
- C) VERB
- D) ADVERB

EXERCISE 4.



Focus

With reference to the text, match the words in Column A with their grammatical functions in Column B.

COLUMN A

- a) _____ automating (line 4)
- b) _____ automated (line 7)
- c) _____ looked (line 7)
- d) _____ identified (line 22)
- e) _____ increasing (line 24)
- f) _____ might (line 32)
- g) _____ mentioned (line 33)
- h) _____ trying (line 34)

COLUMN B

- 1) present participle as adjective
- 2) present participle in elliptical relative phrase
- 3) present participle in progressive form
- 4) past participle in elliptical relative phrase
- 5) past participle as adjective
- 6) past participle in passive form
- 7) past participle in present perfect tense
- 8) gerund
- 9) conditional form
- 10) infinitive

EXERCISE 5.

 **Contextual reference**

With reference to the text, find out what the following words refer to.

- a) they (line 11) _____
- b) they (line 16) _____
- c) them (line 19) _____
- d) its (line 26) _____

EXERCISE 6.

 **Sentence formation**

Put the following sentence into the required tenses and forms:

Search machines create indexes.

- a) Simple present negative _____
- b) Simple past interrogative _____
- c) Simple future affirmative _____
- d) Present perfect negative _____
- e) Past perfect interrogative _____
- f) Future perfect affirmative _____
- g) Present progressive negative _____
- h) Present conditional interrogative _____
- i) Past progressive passive affirmative _____

EXERCISE 7.

 **Linking words**

With reference to the text Searching the Internet, give the **function** and the **translation in context** of the following linking words:

TRANSLATION	FUNCTION
a) _____ such as (line 15)	1) giving example
b) _____ then (line 20)	2) time sequence
c) _____ yet (line 23)	3) listing
d) _____ moreover (line 28)	4) cause and effect 5) contrasting 6) giving definition 7) adding information 8) comparing

Lesson 16

ARTIFICIAL INTELLIGENCE (A.I.)

- (1) In the human brain, a neuron collects signals through delicate structures called dendrites. The neuron sends electrical activity along a thin strand known as an axon, which splits into thousands of branches. At the end of each branch, a synapse converts the activity from the axon into electrical effects that stimulate or inhibit activity in the neuron.
- (2) By creating networks of artificial neurons, artificial intelligence researchers have recently made advances in designing a new kind of computer, one that in its internal circuitry mimics the neural network of the human brain and promises to develop a capacity for learning. Because our knowledge of neurons is incomplete and our computing power is limited, these models are gross idealizations of real neuron networks. However, they are beginning to reveal how the brain processes information and how it accomplishes the remarkable feat of learning.
- (3) Conventional computers have a central processor which handles all the information flowing to or from the computer's memory; this design slows them down because they must work through each task in a step-by-step way. However, artificial neural networks contain multiple microprocessors which are connected to each other by electric circuits, a structure similar to the nerves and synapses of the brain. These tiny "neurons" can process different data simultaneously, in the same way that the brain carries out many small parallel calculations for any ordinary human action - like walking, for example.
- (4) Conventional computers also have difficulty recognizing common elements in images that vary slightly - for example, the same person with different facial expressions - because they rely on precise instructions. The neural net computers, however, look for patterns and similarities instead of exact data. One characteristic of future thinking machines will be the ability to recognize a person by matching, say, a smiling face with its closest approximation held in the memory bank, a skill that could lead eventually to computerized locks that open doors only when a previously programmed face appears. This ability to retrieve relevant information quickly - what computer scientists call free association memory - is one of the distinguishing characteristics of human intelligence, which Artificial Intelligence scientists hope someday to duplicate.
- (5) Examples of artificial intelligence systems include computer programs that perform medical diagnoses, mineral prospecting, legal reasoning, speech understanding, visual interpretation, natural language processing and problem-solving.

 **False friends**

advances (line 6) = progress
gross (line 9) = unrefined/vulgar
eventually (line 24) = in the end
relevant (line 26) = pertinent/essential/relative to

Phrasal Verbs

- to slow down (line 13) = to reduce speed
 to work through (line 13/14) = to work from beginning to end
 to carry out (line 17) = to execute/to perform
 to rely on (line 21) = to depend on/to base oneself on
 to look for (line 21) = to search for

EXERCISE 1. **Reading for main idea**

Indicate which phrase best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not stated, false, detail**.

- a) New computers have been designed to make tactical military decisions _____
 b) New computers are being developed which simulate the learning functions of the brain.

 c) Conventional computers have little difficulty in duplicating functions of the brain.

 d) Computerized door locks will respond only to pre-programmed faces._____

EXERCISE 2. **Comprehension**

Circle the correct answer.

- a) Microprocessors and electric circuits in neural net computers (can)(cannot) be compared to nerves and synapses in the brain.
 b) (Conventional)(Neural-net) computers cannot recognize common elements in images when they differ very little.
 c) Neural-net computers (contain)(do not contain) a single microprocessor.
 d) Conventional computers handle information (randomly)(methodically).
 e) Newly developed computers are designed to recognize (exact data)(pattern similarities).
 f) The central processor handles information (which enters)(which enters and leaves) the memory.
 g) The process of walking is the result of (parallel)(step-by-step) calculations in the brain.

EXERCISE 3. **Vocabulary building**

With reference to the text, decide what the following words mean.

- | | | | |
|------------------------------|-------------------|---------------------|-------------------|
| a) slightly (line 20) means: | i) very little | ii) very much | iii) very lightly |
| b) tiny (line 16) means: | i) important | ii) extremely small | iii) made of tin |
| c) feat (line 11) means: | i) head | ii) failure | iii) achievement |
| d) skill (line 24) means: | i) an opportunity | ii) a job | iii) an ability |
| e) retrieve (line 26) means: | i) lose | ii) find | iii) recover |
| f) advances (line 6) means: | i) changes | ii) ideas | iii) progress |

EXERCISE 4. **Verb formation**

Complete the following table with the missing parts of the irregular verbs:

Infinitive	Simple Past	Past Participle
to begin	understood	led
to learn	_____	_____

EXERCISE 5. **Contextual reference**

Look back at the text and find out what the following words refer to:

- a) one (line 6) _____
 b) they (line 9) _____
 c) them (line 13) _____
 d) they (line 21) _____
 e) its (line 23) _____
 f) what (line 26) _____
 g) which (line 27) _____

EXERCISE 6.

 **Cloze test**

Fill in the gaps in the following version of the text on Artificial Intelligence using these words and expressions:

because, that of, therefore, moreover, whereas, on the other hand, which, for example, since, simultaneously

Researchers have designed a new kind of computer 1) _____ resembles the neural network of the human brain, 2) _____, it may develop a certain learning capacity. Conventional computers are limited 3) _____ they have to handle information methodically, 4) _____ neural-net computers contain a network of microprocessors similar to 5) _____ the human brain, which allows different data to be processed 6) _____. 7) _____, conventional computers cannot recognize slightly different images easily 8) _____ they need exact instructions. The new computers, 9) _____, can search for similarities rather than precise data. 10) _____, these machines may soon be able to quickly match a new image with the one most similar in the memory bank.

EXERCISE 7.

 **Focus**

With reference to the text, match the words or expressions in Column A with their grammatical functions in Column B:

COLUMN A

- a) _____ designing (line 6)
- b) _____ its (line 6)
- c) _____ made (line 6)
- d) _____ learning (line 8)
- e) _____ conventional (line 12)
- f) _____ flowing (line 12)
- g) _____ information (line 12)
- h) _____ this (line 13)
- i) _____ thinking (line 22)
- j) _____ closest (line 23)
- k) _____ programmed (line 25)
- l) _____ problem-solving (line 31)

COLUMN B

- 1. past participle as adjective
- 2. present participle as adjective
- 3. comparative form
- 4. superlative form
- 5. gerund
- 6. possessive adjective
- 7. possessive pronoun
- 8. word with adjective-forming suffix
- 9. word with noun-forming suffix
- 10. present perfect tense
- 11. past perfect tense
- 12. present participle in elliptical relative phrase
- 13. past participle in elliptical relative phrase
- 14. demonstrative pronoun
- 15. demonstrative adjective

Lesson 17

COMPUTERS AS MIND READERS

- (1) The marriage of Man and machine is one of the most intriguing images in science fiction. To some futurists, the most fascinating possibility is what science fiction calls "wetware", that is, the linking of the human brain and computers. The word "wet" refers to the brain and "wetware" is a play on the terms hardware (computer equipment) and software (computer programs). With wetware humans would be connected directly to the machines 5 and therefore, the computer could literally read their brain waves and their thoughts and type them out on the screen.
- (2) Virtual telepathy is probably generations away, but researchers are currently experimenting with devices that might someday evolve into a kind of wetware. Scientists are trying to create computer images through electrodes attached to the brain, arm or facial muscles. 10 These systems function by translating the electrical signals generated by the nervous system into patterns that the computer can read. This research helps increase computer access for disabled people who could substitute an eye or a facial movement for fingers on the keyboard.
- (3) A few manufacturer's are working on ways of using this technology. The BioMuse computer 15 from a company in Palo Alto, California, processes signals from muscles, eyes and brains. An armband or sweatband picks up the electrical signals. The BioMuse isn't reading the user's minds in the science-fiction sense; it turns the body's electrical impulses into digital data that the computer understands. Ultimately, the BioMuse could allow users to control the computer through thinking. The computer could interpret thought patterns as different 20 commands, according to the software used.
- (4) Another small company, IBVA technology of New York, says its Interactive Brainware Visual Analyzer transforms brain waves, again collected by a device which resembles a headband, into many forms, including music. As you become angry, for example, your brain waves change and the musical notes corresponding to particular emotional patterns 25 reflect this change. For instance, if you are stressed, the computer would translate that tension into a command to turn on soft lights and soothing music.
- (5) In March, the company Advanced Neurotechnologies presented its "Brain-Link" computer-interface system. After a training session, users can learn to control their brain waves; the user studies a pattern on the screen and then concentrates until he can reproduce that 30 pattern.
- (6) MindSet was developed by a California research organization dedicated to studying the interaction between humans and dolphins. It draws maps of a user's brain waves on a computer screen. Sunil Gupta, the creator of MindSet, predicts that the device could be used to control computer functions. Someday, interaction between humans and computers 35 will be "transparent" – in other words, there will be no artificial barriers such as a keyboard. Machines and humans will interact using a range of senses – auditory, visual and tactile, although no machine could come close to storing even a fraction of the images in our brain.

EXERCISE 1.

 **Reading for main idea**

Indicate which phrase best expresses the **main idea** of the text. Explain why you eliminated the other choices using the words: **not-stated, false, detail**.

- a) Wetware-like devices are often used during sporting events. _____
- b) Researchers are working on the development of computer devices which can read and translate human cerebral functions and thought processes. _____
- c) Wetware, the union between Man and Machine, is a current reality. _____
- d) The disabled would benefit from the development of virtual telepathy devices. _____

EXERCISE 2.

 **Contextual reference**

Look at the text and find out what the following words refer to.

- a) their (line 6) _____
- b) it (line 18) _____
- c) its (line 22) _____
- d) their (line 29) _____
- e) he (line 30) _____

EXERCISE 3.

 **Reading for detail**

Decide whether the following statements are TRUE or FALSE by referring to the text. If TRUE, put a cross on "T" and give a full numerical line reference; if FALSE, put a cross on "F" and rewrite the statement given in the exercise to make it true.

- a) Wetware could connect the human brain to the computer.
"T" Line reference _____
"F" Corrected statement _____
- b) The Interactive Brainwave Visual Analyzer can translate brain waves into musical notes reflecting one's humors.
"T" Line reference _____
"F" Corrected statement _____
- c) MindSet could eventually be used to control body functions.
"T" Line reference _____
"F" Corrected statement _____
- d) Future computers will no longer need to use input devices.
"T" Line reference _____
"F" Corrected statement _____

- e) Computer commands could eventually be produced by thought patterns.

"T" Line reference _____

"F" Corrected statement _____

EXERCISE 4.

 **Focus**

With reference to the text, match the words in Column A with their grammatical functions in Column B.

COLUMN A

- a) _____ intriguing (line 1)
- b) _____ linking (line 3)
- c) _____ connected (line 5)
- d) _____ experimenting (line 8)
- e) _____ might (line 9)
- f) _____ attached (line 10)
- g) _____ disabled (line 13)
- h) _____ facial (line 13)
- i) _____ corresponding (line 25)
- j) _____ could (line 34)

COLUMN B

- 1) present participle in progressive form
- 2) present participle as adjective
- 3) present participle in elliptical relative phrase
- 4) gerund
- 5) modal verb
- 6) word with noun-forming suffix
- 7) word with adjective-forming suffix
- 8) word with adverb-forming suffix
- 9) past participle in passive form
- 10) past participle in elliptical relative phrase
- 11) past participle as adjective
- 12) past participle in perfect tense
- 13) simple past tense

EXERCISE 5.

 **Sentence formation**

Put the following phrase into the tenses and forms requested.

Virtual telepathy increases computer access for disabled people.

- a) Simple present interrogative _____

b) Present perfect negative _____

c) Simple past passive affirmative _____

d) Present conditional affirmative _____

e) Future perfect interrogative _____

f) Past progressive negative _____

EXERCISE 6.

 **Cloze test**

Fill in the gaps of this version of the text with the following linking words.

Even though, for example, moreover, eventually, so

Wetware devices are being invented which could connect the human brain directly to the computer. They can transform the electrical signals emitted by the body's nervous system into patterns that the computer understands. (1) _____, the BioMuse processes signals from muscles, eyes, and brains, picked up through an armband or sweatband and could (2) _____ allow users to control the computer with their thought patterns. In addition, the Interactive Brainware Visual Analyzer transforms brain waves into musical notes which reflect a person's mood. MindSet draws maps of the user's brain waves on the screen and could one day be used to control computer functions. (3) _____, the Brain Link computer interface is used to teach users to control their brain waves and reproduce patterns on the screen just by concentrating. (4) _____, the final aim is to eliminate artificial input devices and allow machines and humans to interact through auditory, visual and tactile senses, (5) _____ the computer will never be able to reach the capacity of the human brain.

EXERCISE 7.

 **Linking words**

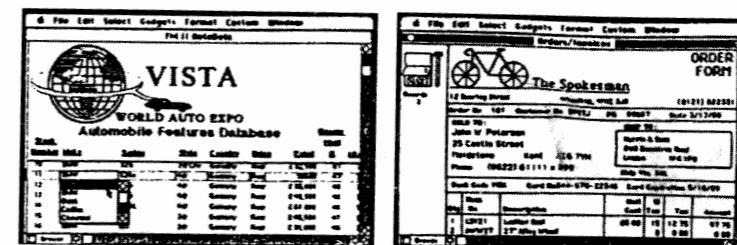
With reference to the text Computers as Mind Readers, give the **function** and the **translation in context** of the following words:

	TRANSLATION
a)	therefore (line 6)
b)	ultimately (line 19)
c)	as (line 24)
d)	for instance (line 26)
e)	although (line 38)

	FUNCTION
1)	giving example
2)	time sequence
3)	listing
4)	cause and effect
5)	contrasting
6)	giving definition
7)	adding information
8)	comparing

Lesson 18

WHO, WHAT, WHERE, WHEN AND WHY



- (1) How? With FileMaker II from Claris. You see, it really doesn't matter how you want your information. With FileMaker II you can extract it in any way you wish. However it suits you. However your business needs it.
 - (2) FileMaker II is a totally flexible database program. It allows you to mix and match and cross reference any information you've saved.
 - (3) Stock controls and mailers; catalogues and directories; reports and employee records; invoicing and information: all can be manipulated, filtered and collated to suit whatever purpose you have.
 - (4) Your choice of information – or data, charts, graphics, dates and addresses – can be presented in a style tailored to suit your task. So you'll always be handling the right information in the most relevant and presentable layout.
 - (5) Even with all its advanced features, FileMaker II is easy to use. Using the Macintosh interface it presents all your options as simple pull down menus. You've got pre-designed templates as well as the ability to customise. There's a search and sort facility, so, instead of tedious analysis, you have instant access coupled with the ability to sort the data in any order you want to.
 - (6) We give you "Lookup" files which reduce the risk of errors and automatically copy from one file to another, saving you valuable time, as well as "Scripts" to automate tedious repetitive tasks.
 - (7) For advanced networking needs we've designed FileMaker II with networking software built in, and to keep sensitive information confidential we've built in passwords to make files inaccessible to other users.
 - (8) So, for once, you needn't be a programmer to have access to a database as powerful as this.
- And the next time you need to know who, what, where, when and why, you'll know how.

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ONE, Telephone (0256)-463344.

False friends

mailers (line 6) = publicity literature sent by post
collated (line 7) = collected, put together
relevant (line 11) = pertinent, essential, relative to
facility (line 14) = service, capability
scripts (line 18) = small written commands
sensitive (line 21) = secret, private

Phrasal Verbs

to look up (line 17) = to find by consultation
to build in (line 21) = to incorporate

EXERCISE 1.

Reading for detail

Decide whether the following statements are true or false by referring to the text.

- a) _____ FileMaker II's complex technology makes manipulating it hard for the user.
- b) _____ Access to your data is helped by FileMaker II's ability to identify specific information quickly and put it into the order required.
- c) _____ FileMaker II allows other users to access your secret data files.
- d) _____ "Look up" files help you to avoid making mistakes and save time.
- e) _____ To be able to use FileMaker II, you must be skilled.
- f) _____ FileMaker II allows you to organise your data personally.
- g) _____ Extra software is required if you have networking needs.
- h) _____ "Scripts" can replace people in doing routine tasks.

EXERCISE 2.

Question formation

The following statements are **answers** to questions regarding FileMaker II. Formulate suitable questions, using appropriate "Question Words" like who, what, why, how, where etc.

- a) Claris does.

- b) It is a database program.

- c) It is based in Berkshire.

- d) It is (0256)-463344.
- e) By means of built-in passwords.
- f) Because it allows you to mix, match, and cross-reference any information you've saved.
- g) When I need to reduce the risk of errors and automatically copy from one file to another.

EXERCISE 3.

Contextual reference

Look back at the text and decide what the following words refer to:

- a) it (the first in line 2) _____
- b) all (line 7) _____
- c) its (line 12) _____
- d) it (line 13) _____
- e) this (line 24) _____

EXERCISE 4.

Focus

With reference to the FileMaker II text, match the words in Column A with their grammatical functions in Column B.

COLUMN A	COLUMN B
a) _____ can (line 2)	1) possessive adjective
b) _____ presented (line 9)	2) defective verb
c) _____ handling (line 10)	3) past participle as adjective
d) _____ its (line 12)	4) simple past
e) _____ advanced (line 12)	5) passive form
f) _____ which (line 17)	6) gerund
g) _____ repetitive (line 19)	7) progressive verb form
h) _____ networking (line 20)	8) relative pronoun
i) _____ we've built in (line 21)	9) present participle as adjective
j) _____ programmer (line 23)	10) adjective-forming suffix
	11) noun-forming suffix
	12) present perfect tense

EXERCISE 5.

 **Vocabulary building**

With reference to the FileMaker II text, choose the appropriate synonym for each of the following:

a) "presented in a style tailored to suit your task" (line 9/10) means:

- 1) made to fit you
- 2) made to fit your needs
- 3) made to fit a tailor

b) "customise" (line 14) means:

- 1) to be a customer
- 2) to personalise
- 3) to consume

c) "passwords to make files inaccessible" (line 21/22) means:

- 1) anyone can access the files
- 2) no one can access the files without the proper word
- 3) files are inaccessible to everyone

d) "sort" (line 14) means:

- 1) to order
- 2) to put in order
- 3) to extract

e) "employee records" (line 6) means:

- 1) data pertaining to workers
- 2) information pertaining to employers
- 3) employee's favourite disk

Texts for Mathematics Students



Lesson 1

MATHEMATICAL OPERATIONS

- (1) Addition means summing up several numbers into one whole. Suppose we have to sum up the numbers: $325 + 454 + 366 = 1145$ (sum or answer). We begin with the column on the right hand and sum the figures up from below. Then we take the next column and so on, saying: 6 and (or plus) 4 are 10, and 5 are 15; put down 5 and carry 1; etc. The total will be one thousand one hundred and forty-five. The same result will be found if we begin to sum up from the top downwards.
- (2) Subtraction is the name of the operation by which a smaller number is taken from a greater. The difference between the greater and the lesser number is called the remainder. Suppose we have to subtract (or deduct) the number 522 from 895. We write down the greater number 895 (which is called the minuend) from which the smaller number called the subtrahend is to be subtracted.
- | | |
|-----------|-------------|
| From | 895 |
| Deduct | <u>-522</u> |
| Remainder | 373 |
- Beginning from the right we say thus: 2 from 5 leaves 3, etc. In order to prove that the result is right, add the remainder to the subtrahend and the total must reproduce the minuend. Thus subtraction is proved by addition.
- (3) The number to be multiplied is named the multiplicand; the one which denotes how many times the given number is to be taken is denominated the multiplier. The multiplicand and the multiplier are also called factors; the result of the operation of multiplying two numbers is called the product. In order to be good at multiplication, a thorough knowledge of the "Multiplication Tables" is absolutely necessary. Each figure of the multiplicand must be multiplied by each figure of the multiplier. After summing up the products, the total product is obtained. Multiplication is only an abridged addition.
- (4) Division is the operation by which one finds how many times one number, called the divisor, is contained in another, called the dividend. The result of division is denominated the quotient. Thus, 24 divided by 6 is 4, or in other words: 6 goes into 24 four times. Sometimes there will be a remainder, for instance: 23 divided by 5 is 4, and 3 is the remainder. In order to prove that the result is right, multiply the quotient by the divisor, and add the remainder; the total must reproduce the dividend.
- (5) Three-fourths ($\frac{3}{4}$) is a vulgar (common or simple) fraction, consisting of the numerator 3 and the denominator 4. The denominator tells us how many equal parts the unit is divided into. The numerator shows us how many of these parts are taken. A vulgar fraction is called a proper fraction when its numerator is less than the denominator. It is called an improper fraction when its numerator is equal to or larger than the denominator. A mixed number is a whole number and a fraction written together; for example, $2 \frac{1}{2}$ is a mixed number. A complex fraction is a fraction having another fraction in the numerator, or denominator or both ($\frac{1}{4} \frac{7}{8}$)
- (6) There are also decimal fractions. A decimal fraction is merely a fraction having a denominator (not written) of 10, 100, 1000, or some similar multiple of 10. A decimal

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- fraction is written by first putting down a period or decimal point and then writing the numerator of the fraction after the decimal point, in such a manner that the denominator can be understood (.5 = five tenths; .05 = five hundredths; .005 = five thousandths, etc.).
- (7) Everything that comes after the decimal point (to the right of it) is a fraction. All figures to the left of the decimal point are whole numbers or integers. 1.62 is read: one point six two. 45 5.34 is read: five point three four; 0.007 is read: point nought (zero) nought (zero) seven.
- (8) The square of 7, or 7 squared, is 7 times 7 or 49; the cube of 7 or 7 cubed is $7 \times 7 \times 7 = 343$; the twentieth power of seven is the product of 7 multiplied twenty times by itself. On the other hand, 7 is the square root of 49, and 7 is also the cube root of 343. Equally, the fourth, fifth, etc. roots may be extracted from any number. All the above-mentioned operations 50 are frequent in algebra, especially in solving equations.

Phrasal Verbs

putting down
write down
sum up

EXERCISE 1. **Reading for detail**

Decide whether the following statements are true or false by referring to the text. If TRUE, put a cross on "T" and give a full numerical line reference; if FALSE, put a cross on "F" and rewrite the statement given in the exercise to make it true..

- a) Multiplication is a shortened form of addition

"T" Line reference _____
"F" Corrected statement _____

- b) Division is proved by addition.

"T" Line reference _____
"F" Corrected statement _____

- c) The minuend is subtracted from the subtrahend.

"T" Line reference _____
"F" Corrected statement _____

- d) Subtraction is proved by multiplication.

"T" Line reference _____
"F" Corrected statement _____

- e) Division means finding out how many times one number goes into another.

"T" Line reference _____
"F" Corrected statement _____

- f) Fractions are found to the right of the decimal point.

"T" Line reference _____
"F" Corrected statement _____

- g) To square a number means to multiply it by itself three times.

"T" Line reference _____
"F" Corrected statement _____

- h) Whole numbers are the same as fractions.

"T" Line reference _____

"F" Corrected statement _____

- i) Knowledge of the multiplication tables is a must.

"T" Line reference _____

"F" Corrected statement _____

EXERCISE 2. **Defining mathematical terms**

Supply each term with its appropriate definition.

Remainder _____

Sum _____

Subtrahend _____

Minuend _____

Multiplicand _____

Multiplier _____

Product _____

Divisor _____

Dividend _____

Numerator _____

Denominator _____

EXERCISE 3. **Question formation**

With reference to the text, formulate questions to the following answers using question words such as: what, which, how, etc.

- a) Computers are not replacing mathematicians.

- b) It means multiplying a number by itself.

- c) An example is $5 \frac{3}{4}$.

- d) It can be proven by multiplying the quotient by the divisor and adding the remainder.

- e) It is called a quotient.

EXERCISE 4.



Focus

Match the words in Column A with their grammatical functions in Column B:

COLUMN A

- a) _____ summing up (line 1)
- b) _____ must (line 30)
- c) _____ multiplied (line 48)
- d) _____ lesser (line 8)
- e) _____ called (line 10)
- f) _____ multiply (line 29)
- g) _____ solving (line 51)
- h) _____ consisting (line 31)
- i) _____ written (line 36)
- j) _____ mixed (line 36)

COLUMN B

- 1) noun-forming suffix
- 2) comparative form
- 3) gerund
- 4) present participle as adjective
- 5) past participle as adjective
- 6) present participle substituting relative phrase
- 7) future tense
- 8) passive form
- 9) adjective-forming suffix
- 10) present perfect tense
- 11) imperative form
- 12) defective verb
- 13) past participle in elliptical relative phrase

EXERCISE 5.



Linking words

Define the function of the linking adverbials in bold type from the following list:

- 1) adding information
- 2) time sequence
- 3) listing
- 4) indicating cause and effect
- 5) contrast
- 6) giving example/definition

- _____ a) The square of 7 is 49 **whereas** 7 is the square root of 49.
- _____ b) **Because** he was too busy, he did not draw the graph.
- _____ c) **In addition** to their speed, computers are accurate and can do repetitive operations.
- _____ d) **In other words**, $\frac{8}{5}$ is an improper fraction.
- _____ e) **For instance**, a pentagon means a five-sided figure.
- _____ f) She got an excellent mark in mathematics **therefore** she decided to become a mathematician.
- _____ g) I like geometry, **however**, I do not like mathematical statistics.
- _____ h) A computer can solve a complex problem in seconds **while** man would take weeks, maybe months, to do the same operations.
- _____ i) The memory capacity of **earlier** computers was not as large as those of today.
- _____ j) To sum up numbers, **first** we sum the figures in the right-hand column, **then** we take the next column and do the same.
- _____ k) **Thus**, subtraction is proved by addition.

EXERCISE 6.

Numbers



Read and write in words the following expressions.

- 3,829 _____
- $25 \div 5 = 5$ _____
- 0.33 _____
- $\frac{3}{4}$ _____
- $4 \times 8 + 5 = 37$ _____
- $10 \frac{1}{2}$ _____
- $38 - 21 = 17$ _____
- $11 \frac{2}{5}$ _____
- $52 \div 6 = 8.66666$ _____
- 765.74 _____
- $13 + 33 + 12 + 0 = 58$ _____
- 8^3 _____
- $103 - 72 = 31$ _____
- 282 _____
- $4 \times 5 \times 7 = 140$ _____
- $3\sqrt[3]{343}$ _____
- $22 + 51 - 10 = 63$ _____
- $\sqrt{64}$ _____
- $81 \times 11 = 891$ _____
- 136,848 _____
- $579 - 262 = 317$ _____
- x^{n-1} _____
- $1867 - 1108 = 759$ _____
- 1555.05 _____
- $\frac{1}{4} + \frac{3}{4} = \frac{4}{4} = 1$ _____
- 19,199 _____
- $0.73 \times 1.66 = 1.2118$ _____
- $(3 \times 5) + 2 = 17$ _____
- $5^2 = 25$ _____
- $10 \frac{3}{4} + 3 \frac{1}{4} = 14$ _____
- 4.365 _____
- 4,365 _____
- $(\frac{3}{4} \times 8 + 10) \div 2 = 8$ _____
- 139,240 _____
- $23 \times 11 + 2 = 255$ _____
- $(\sqrt{36} \times 10) - 2^4 + 42.5 = 86.5$ _____
- $2,512 + 1,320 = 3,832$ _____
- $0.12 + 3.22 = 3.34$ _____
- $74 - 10 + 3 = 67$ _____

STUDENT NOTES

Lesson 2

LOGICAL PRINCIPLES AND MATHEMATICAL CONNECTIVES

- (1) In proving mathematical propositions or theorems, it is necessary to accept certain logical principles or rules. For the most part these are familiar to the reader through frequent usage. One of these principles, the so-called **law of the excluded middle**, is to the effect that any meaningful statement is either true or false. For example, the statement "if $a \neq 0$, then $a^2 > 0$ " has been proved true while the assertion "an integer 'a' exists such that $0 < a < 1$ " has been shown to be false. Acceptance of the principle of the excluded middle forces the conclusion that a proposition is true if it has been shown to be not false and that it is false if demonstrated to be not true. **The principle of non-contradiction** is also assumed; that x is a statement, cannot be both true and false. If an assertion has been shown to be true, then it may not also be false; if false, then it is not true. 10
- (2) Generally, theorems or propositions we wish to prove (or disprove) will be in the form of "ifthen" statements. For example, "if $a > 0$, then $-a < 0$ ", or "if a and b are integers, then $(-a/b) = - (a/b)$ ". Such propositions may be represented symbolically in the form of "if p , then q " or " p implies q ", where p and q stand for certain assertions. In the first example, p is the assertion " $a > 0$ ", while q is " $-a < 0$ ". Conventionally, p is called the 15 hypothesis of the proposition and q the conclusion. Regarding the propositions "if p , then q ", three questions may be asked: Is p true?, Is q true?, Is the proposition itself true? Usually it is with the last that we are concerned. As far as axioms are concerned, we shall say that they are true in the sense that they are self-evident and we simply accept them as such. We assert them to be the basic truths upon which all that follows may be justified. In 20 this sense then all consequences of the axioms, for example $0 < 1$, will be considered true.
- (3) In mathematical discourse and elsewhere, one constantly encounters declarative sentences which have been formed by modifying a sentence with the word "not", or by connecting sentences with the words "and", or, "if....then", and "if and only if". These five words or combinations of words are called mathematical connectives. 25
- (4) A sentence which is modified by the word "not" is called the negation of the original sentence. For example, "2 is not a prime", is the negation of "2 is a prime". The word "and" is used to join two sentences to form a composite sentence or conjunction of the two sentences. For example, the sentence "The sun is shining and it is cold outside" is the conjunction of the sentences "The sun is shining" and "it is cold outside". A sentence 30 formed by connecting two sentences with the word "or" is called the disjunction of the two sentences. From two sentences we may construct one of the "if....., then" forms; this is called a conditional sentence. The sentence immediately following "if" is the antecedent, and the sentence immediately following "then" is the consequent.
- (5) There are several other idioms in English which we shall regard as having the same meaning 35 as "if P , then Q " (where P and Q are sentences): for example, " P implies Q "; " P only if Q "; " P is a sufficient condition for Q "; " Q provided that P "; " Q if P "; " Q is a necessary condition

for P". The words "if and only if" are used to obtain a biconditional sentence from two sentences. We regard the biconditional "P if and only if Q" as having the same meaning as "if P, then Q", and "if Q, then P".

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EXERCISE 1.

Reading for detail

Decide whether the following statements are true or false by referring to the text. If **TRUE**, put a cross on "T" and **give a full numerical line reference**; if **FALSE**, put a cross on "F" and **rewrite the statement given in the exercise** to make it true.

- a) The law of the excluded middle says that a statement cannot be both true and false.
"T" line reference _____
"F" corrected statement _____
- b) Axioms are assumed to be true.
"T" line reference _____
"F" corrected statement _____
- c) The word "and" forms composite sentences.
"T" line reference _____
"F" corrected statement _____
- d) The word "or" forms a conjunction of two sentences.
"T" line reference _____
"F" corrected statement _____
- e) The **IF** clause of a conditional sentence is called the antecedent.
"T" line reference _____
"F" corrected statement _____
- f) "If P ... then Q" is a biconditional statement.
"T" line reference _____
"F" corrected statement _____

EXERCISE 2.

Contextual reference

With reference to the text, find out what these words refer to:

- a) these (line 2) _____
- b) it (line 7, first) _____
- c) it (line 10, first) _____
- d) them (line 20) _____
- e) which (line 26) _____
- f) which (line 35) _____
- g) the last (line 18) _____

EXERCISE 3.

Locating information

With reference to the text, answer the following questions.

- a) What must we accept in proving mathematical theorems?

- b) What is the definition of the law of the excluded middle?

- c) In what sense are axioms true?

- d) What does the principle of non-contradiction mean?

- e) How would you define a biconditional sentence?

- f) What is the difference between conjunction and disjunction?

- g) What do p and q stand for?

EXERCISE 4.

'Ing' form

Define the underlined "ing" form (present participle as adjective, gerund, present participle in elliptical relative phrase, present participle in progressive form, preposition) in the following phrases.

- a) She is good at **counting** numbers. _____
- b) **During** the 17th and 18th centuries, many easy ways of **calculating** were devised.
_____ / _____
- c) We are **looking forward to** **studying** new books on the theory of numbers. _____ / _____
- d) The first **calculating** machine appeared in the early 1800s. _____
- e) We insisted on the experiment **being** repeated. _____
- f) **Defining** the precise coordinates of x and y is the task of algebraists. _____
- g) The analog computer makes use of a continuously **varying** signal to represent data.

EXERCISE 5. **Comprehension**

Match each term with its appropriate definition

- | | |
|-------------------|---|
| _____ axiom | a) result that follows from a theorem often without further proof |
| _____ hypothesis | b) a postulate; truth is either self-evident or to be assumed |
| _____ theorem | c) proposed possible explanation for a phenomenon |
| _____ proposition | d) conclusion reached by inadequate evidence or guesswork |
| _____ assertion | e) theorem proved for use in the proof of a subsequent theorem |
| _____ lemma | f) statement for which a proof is either required or provided |
| _____ corollary | g) statement established by means of a proof |
| _____ conjecture | h) affirmation, declaration |

EXERCISE 6. **Focus**

Match the words in Column A with their grammatical functions in Column B.

COLUMN A

- _____ a) proved (line 5)
- _____ b) to be false (line 6)
- _____ c) shown (line 7)
- _____ d) modifying (line 23)
- _____ e) called (line 33)
- _____ f) meaning (line 39)
- _____ g) shining (line 30)
- _____ h) excluded (line 6)
- _____ i) connecting (line 23)
- _____ j) formed (line 31)

COLUMN B

- 1) gerund
- 2) present participle as adjective
- 3) present participle in elliptical relative phrase
- 4) progressive form
- 5) past tense
- 6) past participle as adjective
- 7) past participle in passive form
- 8) past participle in elliptical relative phrase
- 9) infinitive
- 10) noun-forming suffix
- 11) irregular verb
- 12) adjective-forming suffix

EXERCISE 7. **Sentence formation**

Put the following phrase into the passive form requested:

The scientific press devoted many articles to the discovery of new concepts.

- Present passive _____
 Future passive _____
 Present perfect passive _____
 Present progressive passive _____
 Conditional passive _____

EXERCISE 8. **Conditional form**

Indicate the type of conditional phrase for the following sentence and transform them into the other two conditional types.

- 1) If you express these statements in mathematical terms, you will obtain the following equation.
 (Type _____)
 (Type _____)
 (Type _____)

- 2) If you divide a cone, you will get a different geometrical figure.
 (Type _____)
 (Type _____)
 (Type _____)

EXERCISE 9. **Mathematical connectives**

Consider the following connectives commonly used in mathematics. Write an example using each connective.

CAUSE AND EFFECT

- as _____
 because _____
 since _____
 due to _____
 in view of _____
 owing to _____
 on account of _____
 given that _____
 it follows that _____
 therefore _____

STATING CONDITIONS

- if belongs to
 if and only if
 unless
 whether or not
 provided (providing) that
 if...then
 it is necessary and sufficient that/for....
 let...then
 suppose that.....
 since ...has no, then.....

CONTRAST

- alternatively _____
 although _____
 though _____
 but _____
 except _____
 however _____
 on the other hand _____
 nevertheless _____
 despite/in spite of _____
 rather than _____
 conversely _____
 instead of _____

DEFINITIONS

- Let.....denote.....
 This means that...
 This ... is based on ...
 We say that...
 A is said to beif.....
 A is called if.....
 We defineby....

STUDENT NOTES

Lesson 3

THE LANGUAGE OF MATHEMATICS

(1) It has been said that mathematics is a language; this contention is a little difficult to support if we accept any of the ordinary descriptions of language. However, it is true that there is a standard sort of terminology in mathematics that is much more concise and much briefer than the garden variety of English. All of mathematics can be performed without using this shorthand notation, but its incredible usefulness makes it, practically speaking, a necessity.

(2) The notions of number, addition, and multiplication are undefined. One of the axioms of algebra, called the distributive axiom, is usually stated:

$$(I) \quad x(y+z) = (x \cdot y) + (x \cdot z)$$

The proposition in (I) certainly does not require this $x-y-z$ sort of language; the proposition can be also stated: for any three numbers, the product of the first with the sum of the second and third is equal to the sum of the products of the first with the second and the first with the third. Of course, since we have all studied some algebra, the statement (I) seems considerably simpler than the translation into vernacular which we have just read. And this is one of the points we want to emphasize: the mathematical language is not only shorter, it is easier to understand.

(3) Generally, we shall not abbreviate our statements to quite the extent that (1) is abbreviated. We shall usually include the qualification that is supposed to be understood in (I), and we shall write

(2) For all numbers x, y and z

$$x(y+z) = (x \cdot y) + (x \cdot z).$$

Instead of "for all" we may frequently use "for every", or we may write "for each number x , each y , and each z ". These different expressions are supposed to mean the same thing. What we are really asserting is that if, in the expression " $x \cdot (y+z) = (x \cdot y) + (x \cdot z)$ ", we replace " x ", " y ", and " z " by numbers, then the resulting statement is always correct.

(4) There is another important fact about this mathematical language which should be noticed.

(3) For all numbers a, b , and c

$$a(b+c) = (a \cdot b) + (a \cdot c)$$

and

(4) For all numbers a, r , and x

$$a(r+x) = (a \cdot r) + (a \cdot x)$$

state precisely the same fact that is stated by (2). That is, the particular letters that are used in a statement of this sort are inconsequential and can be varied almost at random.

(5) There is another sort of statement which will occur frequently in our work. Consider the following:

(5) There is a number x such that $x+2=5$.

(6) For some number a , $a+2=5$.

(7) There exists a number r such that $r+2=5$.

Clearly, all of these statements assert the same fact: there is a number which, when added to 2, yields 5. It is sometimes said that the statements of the form " $x+2=5$ " are conditional

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- equations, and the statements of the form " $x + y = y + x$ " are identities. We shall not use this technical sort of jargon.
- (6) There is one more question of meaning which we would like to discuss before ending this linguistic introspection. In just what sense is equality used? If, in a discussion of arabic and roman numerals, we assert that $4 = \text{IV}$, what is to be inferred from this statement? We 45 shall always use equality in the sense of logical identity, and the assertion, " $4 = \text{IV}$ " is simply to mean that "4" and "IV" are both names for the same object. One object may have many names, and we may use the names interchangeably. Anything which can be said about 4 can be said with the same amount of truth about IV.
- (7) There are several statements about equality which are sometimes taken as axioms: for 50 example, "each thing is equal to itself", "things equal to the same thing are equal to each other" and "if, in an equation, equals are substituted for equals, the results are equal". Because we use equality only in the sense of identity, we can accept such statements (and many more precise statements of this kind) as part of our natural conception of the notion of identity. Of course, $4 = 4$ since each object is identical with itself. We may infer that 55 $+ 2 = 4$ if we know that $2 + 2 = 3 + 1$ and $3 + 1 = 4$. These last two equalities tell us that "2 + 2" and "3 + 1" are names for the same object; we simply have three different names for the same number, and quite evidently $2 + 2 = 4$. A statement of equality is always to be considered intuitively as an assertion that the symbols on the left of the equality sign name the same thing that is named by the symbols on the right.
- (8) We shall use letters "x", "y", etc, as if they were names. Strictly speaking, they are not names, although one frequently finds in mathematics books such statements as "let x denote a fixed but arbitrary number...". Actually we use letters in much the same way that pronouns are used, and just as pronouns are used in sentence structure like nouns, so letters are used in mathematical structures like names. Similar rules of "grammar" are to be used for letters 65 and for names. Thus, if x is a number and $x + 5 = 7$, we take the view that "x + 5" names the same number as is named by "7", and hence infer that $(x + 5) + (-5) = 7 + (-5)$. In more detail, we might phrase the reasoning as follows. It is true that $7 + (-5) = 7 + (-5)$ because each thing is identical with itself. If $x + 5 = 7$, then "x + 5" and "7" are names for the same thing, and we may replace "7" in " $7 + (-5)$ ", using the other name "x + 5", and so find that 70 $(x + 5) + (-5) = 7 + (-5)$.

60

EXERCISE 1.**Focus**

Match the words in Column A with their grammatical functions in Column B

COLUMN A

- a) _____ resulting (line 25)
- b) _____ ending (line 43)
- c) _____ what (line 45)
- d) _____ asserting (line 24)
- e) _____ anything (line 48)
- f) _____ can be said (line 49)
- g) _____ using (line 4)
- h) _____ its (line 5)
- i) _____ called (line 8)

COLUMN B

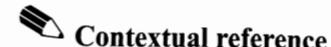
- 1) present participle as adjective
- 2) interrogative pronoun
- 3) present participle in progressive form
- 4) gerund
- 5) possessive adjective
- 6) simple future
- 7) past participle in passive form
- 8) present participle in elliptical relative phrase
- 9) possessive pronoun

- | | |
|----------------------------------|---|
| j) _____ shall include (line 18) | 10) adverb |
| k) _____ undefined (line 7) | 11) relative pronoun |
| | 12) quantitative pronoun |
| | 13) past participle as adjective |
| | 14) past participle in elliptical relative phrase |
| | 15) modal verb |

EXERCISE 2.**Reading for detail**

With reference to the text, decide whether the following statements are true or false; if TRUE, put a cross on "T" and give a full numerical line reference; if FALSE, put a cross on "F" and rewrite the statement given in the exercise to make it true.

- a) Mathematics has its own language.
"T" Line reference _____
"F" Corrected statement _____
- b) In Mathematics equality does not always mean logical identity.
"T" Line reference _____
"F" Corrected statement _____
- c) Shorthand notation is absolutely necessary in order to write mathematics.
"T" Line reference _____
"F" Corrected statement _____
- d) There is no need to use specific letters in mathematical statements
"T" Line reference _____
"F" Corrected statement _____
- e) In an equality, what is on the right is always identical to that on the left.
"T" Line reference _____
"F" Corrected reference _____
- f) The substitution of numbers by letters is the same as the substitution of nouns by pronouns
"T" Line reference _____
"F" Corrected statement _____
- g) The choice of the specific letter to be used in mathematical equations is irrelevant.
"T" Line reference _____
"F" Corrected statement _____

EXERCISE 3.**Contextual reference**

With reference to the text, find out what the following words refer to:

- a) it (line 5) _____
- b) it (line 16) _____
- c) which (line 26) _____
- d) this (line 1) _____
- e) they (line 61, second) _____

EXERCISE 4. **Linking words**

Match the following linking words with their function. Then translate the words into Italian.

	TRANSLATION	FUNCTION
a)	although (line 62)	1) giving example
b)	because (line 53)	2) indicating time sequence
c)	that is (line 32)	3) listing
d)	so (line 64)	4) cause and effect
e)	instead of (line 22)	5) contrasting
f)	but (line 63)	6) defining
g)	however (line 2)	7) adding information
h)	then (line 25)	8) comparing
i)	for example (line 50/51)	
j)	since (line 13)	
k)	thus (line 66)	
l)	hence (line 67)	

EXERCISE 5. **Verb formation**

Transform the following **passive** verbs into their **active** form.

PASSIVE FORM

- a) has been said (line 1)
- b) can be performed (line 4)
- c) is stated (line 8)
- d) should be noticed (line 26)
- f) are used (line 32/33)
- g) can be varied (line 33)
- h) is said (line 40)
- i) is to be inferred (line 45)
- j) is to be considered (line 58/59)
- k) is named (line 67)

ACTIVE FORM

Now, transform the following active verbs into their respective passive form.

ACTIVE FORM

- a) we shall use (line 46)
- b) we may use (line 48)
- c) we can accept (line 53)
- d) we would like to discuss (line 43)
- e) one finds (line 62)
- f) we are asserting (line 24)
- g) we have studied (line 13)

PASSIVE FORM

EXERCISE 6. **Question formation**

With reference to the text, formulate questions to which the following could be answers, using the **question words (who, whom, whose what, when, how, etc).**

a) Solving a mathematical problem originally meant finding its complete numerical solution.

b) We define a system as a set of fixed rules.

c) The importance of this statement was first recognized by von Mises.

d) An identical law was discovered independently by Mariotte in 1680.

e) The first attempt to deduce general equations of equilibrium and vibration of elastic solids was made by Navier.

f) In an equilateral triangle the three angles are all equal.

EXERCISE 7. **Word formation**

Complete the following table with by adding the appropriate suffix.

NOUN	NAME OF PERSON	ADJECTIVE	VERB
analysis			
organization		economic	
employment			industrialize
			lead
		educated	appoint
supervision	performer		program
operation			

MATHEMATICAL EXERCISES - SECTION 1

 A. How are these formulae read?  Write them out first.

$$a + b = c \quad a \times b = e$$

$$a - b = d \quad \frac{a}{b} = f$$

We can also say:

$$a \times b = e \quad \frac{a}{b} = f$$

These signs indicate mathematical processes. What **nouns** and **verbs** are used to talk and write about them?

Sign	Noun	Verb
+		
-		
\times		
\div		

These signs () are called _____

These signs [] are called _____

These signs { } are called _____

ABC _____ letters; def are _____ letters.

How do we read and write: R_x ? _____

 B. How are these fractions read in English?

$$\frac{1}{2} \quad \frac{1}{3} \quad \frac{2}{3} \quad \frac{3}{16} \quad \frac{1}{4} \quad \frac{3}{4} \quad \frac{1}{8} \quad \frac{8}{5}$$

 C. Read out these equations.  Write them out first:

$$1) \quad x = \frac{a+b}{c}$$

$$2) \quad x+y = \frac{A}{a-b}$$

$$3) \quad 1 = a + (n-1)d$$

$$4) \quad V = IR$$

$$5) \quad \frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$6) \quad v = u + at$$

$$7) \quad Ft = mv - mu$$

$$8) \quad \frac{1}{R} = - \frac{M}{EI}$$

$$9) \quad \frac{dQ}{dz} = - q$$

$$10) \quad E = T + P - c + e$$

 D. How are these values read?  Write them out first.

$$x^2 \quad x^{n-1} \quad \sqrt[3]{x}$$

$$x^3 \quad x^{-n} \quad \sqrt[n]{x}$$

$$x^n \quad \sqrt{x} \quad a^{1/2}$$

 E. Practise reading these expressions:

$$1) \quad x^{-p} = \frac{1}{x^p}$$

$$6) \quad y - y_2 = \left(\frac{y_2 - y_1}{x_2 - x_1} \right) (x - x_1)$$

$$2) \quad x^{p/q} = \sqrt[q]{x^p}$$

$$7) \quad \frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$$

$$3) \quad x^2 - a^2 = (x + a)(x - a)$$

$$8) \quad d = \sqrt{(x^1 - x^2)^2 + (y^1 - y^2)^2 + (z^1 - z^2)^2}$$

$$4) \quad y = ae^{kx}$$

$$9) \quad b^2 = a^2(1 - e)$$

$$5) \quad x = \frac{nx_2 + mx_1}{m+n}$$

$$10) \quad x^2 + y^2 + 2gx + 2fy + c = 0$$

SECTION 2** Reading more complex formulae****A. What do these symbols mean in English?**

- | | | |
|--------------------------|------------------|------------------------|
| 1) \equiv _____ | 6) $>$ _____ | 11) \propto _____ |
| 2) \neq _____ | 7) \ll _____ | 12) ∞ _____ |
| 3) $\cong \approx$ _____ | 8) \gg _____ | 13) \pm _____ |
| 4) \rightarrow _____ | 9) \leq _____ | 14) \therefore _____ |
| 5) $<$ _____ | 10) \geq _____ | 15) / _____ |

 B. Practise reading out these expressions:

$$\begin{array}{ll} 1) f = \frac{1}{2\pi\sqrt{LC}} & 6) C = \frac{L}{R^2 + \omega^2 L^2} \\ 2) E = \delta T^4 & 7) v_2 = \sqrt{\left(\frac{2e}{m} V_2\right)} \\ 3) W_s = \frac{2\pi f}{P} & 8) \delta = \frac{\frac{1}{2} \sigma_b^2}{K} \\ 4) \gamma = \frac{W_x}{4\pi R} F & 9) \sigma = \frac{MyC}{I} + \frac{P}{A} \\ 5) \mu_0 = 4\pi \times 10^{-7} \text{ Hm}^{-1} & 10) \gamma = \frac{4Q}{3\pi R^2} (R^2 - \gamma^2) \end{array}$$

 C. Read out these expressions:

- 1) $\tau > 90^\circ$ _____
- 2) $x \rightarrow \infty$ _____
- 3) $e \propto T$ _____
- 4) $\alpha \equiv \beta$ _____
- 5) $a_1 \neq b_1$ _____
- 6) $\theta \cong 0.5^\circ$ _____
- 7) $E \leq \pm 0.32$ _____
- 8) $\mu = 5.3$ _____
- 9) $\therefore E \equiv 1 + \Delta$ _____
- 10) $\lambda > 1$ _____
- 11) $7 \frac{3}{4}$ _____
- 12) $\frac{1}{2} + \frac{2}{3} + \frac{3}{16}$ _____
- 13) $\frac{1}{2} (24 + 9) = x$ _____
- 14) $\frac{15}{16}$ _____
- 15) $\frac{4}{3} \pi r^3$ _____

 D. Write down the formulae you hear.

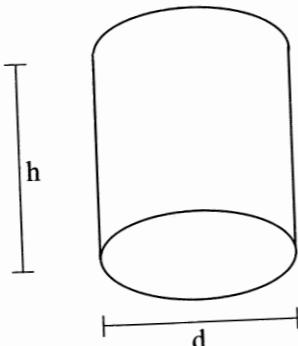
- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____

 **E.** Here is the formula for calculating the volume of a cylinder: $V = \pi r^2 h$

Now read through this simple calculation with your teacher:

A is a solid metal cylinder of height 16.3 cm and diameter 6.7 cm. Calculate its volume.

$$\begin{aligned} V &= \pi r^2 h \\ \pi &= 3.142 \\ r &= d/2 \\ A &= \frac{d}{2} = 3.35 \text{ cm} \\ h &= 16.3 \text{ cm} \\ \therefore V &= 3.142 \times 3.35^2 \times 16.3 \\ &= 574.75 \text{ cm}^3 \end{aligned}$$



SECTION 3

 **A.** What are the processes shown here?

Example: $\frac{x}{y}$

division

1) ab

2) 32×10^{-1}

3) $a^2 + b^2 + c$

4) $y - x^2$

5) $73.2a - 9.27a - a$

 **B.** Put the correct words in these expressions.

For example: $\frac{x}{y}$

divide x by y

6) 34×7 _____ 34 _____ 7

7) $x^2 - x$ _____ x _____ x^2

8) $\frac{a^2b}{c}$ _____ a^2b _____ c

9) $3b + 2c$ _____ 3b _____ 2c

10) ab _____ a _____ b

SECTION 4

  **Drill 1**

Example: a squared plus b squared equals c .

1) $a^2 + b^2 = c$ _____

2) $\frac{x^{1/2}}{d} = 30$ _____

3) $a^2 = \frac{(b - c)^2}{a_1}$ _____

4) $7.6 \times 10^{-3} \text{ ms}^{-1}$ _____

5) $\frac{x^{-1/2}}{a^2 + b^2} = 1$ _____

6) $\left(\frac{y}{a} - \frac{x}{b} \right)^2$ _____

7) $\frac{\sqrt[3]{x^2 + y^2}}{x}$ _____

8) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ _____

 **Drill 2**

For example: What is the square root of x ?

12

What is y to the power of 4?

3.78

$\sqrt{x = 12}$

$\frac{a}{b} = 9$

$d^{1/2} = 2.5$

$y^4 = 3.78$

$x^{-1} = 40$

$a^{-n} = 0.721$

$y^{3/2} = 721.5$

$y^{n-1} = z$

$x^{-7} = 91$

$\sqrt{y^3}$

$\sqrt[3]{z = 7.29}$

 **Drill 3**

For example: Is x equal to y ? No, x is greater than y .
 Is α proportional to β^2 ? No, α is equal to β^2 .

- | | |
|---------------------------|---------------------------|
| 1) $x > y$ | 6) $\theta \leq 90^\circ$ |
| 2) $d \rightarrow \infty$ | 7) $\gamma \geq 45$ |
| 3) $\mu = \pm 30$ | 8) $\alpha \neq \beta$ |
| 4) $a \approx b^2$ | 9) $f \propto d^2$ |
| 5) $z \geq 50$ | 10) $a^2 \equiv b^2$ |

 **Drill 4**

Write down the symbols for these expressions:

Example: Approximately equal \approx

- 1) Not equal _____
- 2) Less than _____
- 3) Tends to _____
- 4) Infinity _____
- 5) Plus or minus _____
- 6) Therefore _____
- 7) Greater than _____
- 8) Proportional to _____
- 9) Equivalent to _____
- 10) Less than or equal to _____
- 11) Per _____
- 12) Much less than _____

 **Drill 5**

Write down these Greek letters (in small letters):

Example: Alpha α

- | | |
|-----------------|-----------------|
| 1) Beta _____ | 6) Tau _____ |
| 2) Gamma _____ | 7) Mu _____ |
| 3) Delta _____ | 8) Pi _____ |
| 4) Theta _____ | 9) Sigma _____ |
| 5) Lambda _____ | 10) Omega _____ |

 **Read the following common mathematical signs.**

Symbol	Meaning	Example	Spoken
\equiv	Equivalent to	$x \equiv y$	x is equivalent to y
\neq	Not equal to	$x \neq y$	x is not equal to y
\approx	Approximately equal to	$x \approx 10$	x is approximately equal to 10
\rightarrow	Tends to	$x \rightarrow 0$	x tends to nought
$<$	Less than	$x < 5$	x is less than five
$>$	Greater than	$x > 5$	x is greater than five
\ll	Much less than	$y \ll 5$	y is much less than five
\gg	Much greater than	$y \gg 5$	y is much greater than five
\leq	Less than or equal to	$x \leq 10$	x is less than or equal to 10
\geq	Greater than or equal to	$y \geq 10$	y is greater than or equal to 10
\propto	Proportional to	$x \propto y$	x is proportional to y
∞	Infinity	$x \rightarrow \infty$	x tends to infinity
\pm	Plus or minus	$x = \pm 2$	x equals plus or minus 2
\therefore	Therefore	$\therefore x = 0$	therefore x equals nought
$/$	Per	km/hr	kilometres per hour
d	Differential	dx	differential of x

GREEK ALPHABET

Prime after a syllable indicates primary accent; double prime secondary accent, as in secretary (sě krą tă"ri) (American pronunciation).

A, α Alpha, pronounced āl' fā

B, β Beta, pronounced bā' tā

Γ, γ Gamma, pronounced gā' mā

Δ, δ Delta, pronounced dēl' tā

E, ϵ Epsilon, pronounced ēp' sälən (Note that the symbol \in for elementhood is not epsilon)

Z, ζ Zeta, pronounced zā' tā

H, η Eta, pronounced ā' tā

Θ, θ Theta, pronounced thā' tā

I, ι Iota, pronounced iō' tā

K, κ Kappa, pronounced kăp' q

Λ, λ Lambda, pronounced lăm' dă

M, μ Mu, pronounced mū

N, ν Nu, pronounced nū

Ξ, ξ Xi, pronounced ksç

O, \circ Omicron, pronounced ô' mikron

Π, π Pi, pronounced pî

P, ρ Rho, pronounced rô

Σ, σ Sigma, pronounced sēg' ma

T, τ Tau, pronounced like cow

Y, υ Upsilon, pronounced oop' sälən

Φ, ϕ Phi, pronounced fî

X, χ Chi, pronounced kî

Ψ, ψ Psi, pronounced psç

Ω, ω Omega, pronounced ô mā' gă

Lesson 4 GEOMETRY

- (1) Geometry is originally a branch of mathematics that deals with the measurement, properties, and relationships of points, lines, angles, planes, and solids. Broadly speaking, the term also refers to the study of properties of given elements that remain constant under specified transformations.
- (2) Points are the basis of all Geometry. They are geometrical elements which have position but no magnitude, i.e. their size is zero. There are four main definitions of a point because over the years many mathematicians have had their own ideas as to what a point should be, and all are equally true. Therefore, we have the *dot*, the *exact location*, the *ordered pair*, and the *node*. Dots have no height, width and length but are only a position in space. Probably, the best example of *dots* today would be pixels, that is, the tiny spots of color that make up a computer screen. The *exact location* is the perfect example of the normal, zero-dimensional point. In real life, it is used by mapmakers to measure distances between two cities; as some cities are large, an exact location must be chosen from which to measure. The third definition is the *ordered pair* which was discovered by Fermat and Descartes. The first number is a point on the x-axis which intersects with a point on the y-axis to identify a precise position on a coordinate plane. Lastly, *nodes* are vertices which exist in networks or graphs.
- (3) A line is made up of an infinite number of points and is a one-dimensional figure having only length but no width or height. It may be curved or straight and every line is either horizontal, vertical or oblique. In space, vertical lines never meet because they just go straight up and down but it is possible for horizontal lines to meet, for example, the edge of the two walls in the corner of the ceiling. Lines can be identical, intersecting, parallel, perpendicular or skew. Identical lines are lines that coincide. Therefore, they are the same line. Intersecting lines have a point in common. Parallel lines never intersect and are everywhere equally distant from each other. A horizontal line is a line parallel to the horizon while a vertical line is a line straight up and down. Perpendicular lines are lines that intersect in one point and form a 90° angle. Skew (oblique) lines are two straight lines in three-dimensional space that do not intersect and are not parallel.
- (4) Planes are two-dimensional. A plane has length and width, but no height, and extends infinitely on all sides. Planes are thought of as flat surfaces, like a table top. A plane is made up of an infinite amount of lines. Two-dimensional figures are called plane figures. An infinite number of planes make up space which is the set of all points. Figures in space are called solids or surfaces. A solid, volume, or body is that which has extension in length, breadth, and thickness.
- (5) An angle is the figure formed by two lines having the same point, called the vertex, as their common origin. A right angle (90°) is formed by lines which are perpendicular to each other; an acute angle is less than a right angle, and an obtuse angle (between 90° and 180°) is greater than a right angle.
- (6) A polygon is a plane figure bounded by straight lines called the sides of the polygon. A figure of three sides is called a triangle. Quadrilaterals are polygons having four sides and

four angles, and include a trapezoid, a parallelogram, a square, a rectangle and a rhombus. Polygons of five sides are called pentagons, those of six sides, hexagons and so on. A circle is a plane figure bounded by a curved line which is called the circumference. All points of the circumference are equidistant from a fixed point called the center. The circumference of a circle is equal to its diameter multiplied by $3.14159 (\pi)$. The diameter 45 of a circle is a line passing through its center and terminating at both ends on the circumference. An arc of a circle is any portion of the circumference. A chord of a circle is a straight line connecting any two points on the circumference.

- (7) Polyhedrons are solid, three-dimensional figures bounded by planes. A prism is a polyhedron with two end faces that are polygons lying in parallel planes called bases, connected by 50 sides which are parallelograms intersecting in parallel lines. A cylinder is much like a prism, but has a circle or any other curved figure as a base. A pyramid is a solid figure formed by a polygon called the base and a series of triangles meeting at a common point called the vertex. A cone is much like a pyramid but has a circle for a base.

EXERCISE 1.

Reading for detail

Indicate whether the following statements are true or false by referring to the text. If **TRUE**, put a cross on "T" and give a **full numerical line reference**; if **FALSE**, put a cross on "F" and **correct the statement given in the exercise** to make it true.

- a) The exact location is used to locate a point on a coordinate plane.

"T" Line Reference _____
"F" Corrected statement _____

- b) A line has width, length and height.

"T" Line reference _____
"F" Corrected statement _____

- c) Parallel lines are equidistant from one another.

"T" Line reference _____
"F" Corrected statement _____

- d) Perpendicular lines form a 180° angle.

"T" Line reference _____
"F" Corrected statement _____

- e) A plane has width and height but no length.

"T" Line reference _____
"F" Corrected statement _____

- f) The origin of an angle is called a vertex.

"T" Line reference _____
"F" Corrected statement _____

- g) A hexagon has straight lines as its border.

"T" Line reference _____
"F" Corrected statement _____

- h) A dot has neither width, length nor height.

"T" Line reference _____
"F" Corrected statement _____

- i) Both a prism and cylinder have polygons as their base.

"T" Line reference _____

"F" Corrected statement _____

j) A diameter divides a circle into two equal parts. _____

"T" Line reference _____

"F" Corrected statement _____

EXERCISE 2.

Comprehension

Match the terms in Column A with the definition in Column B.

COLUMN A

- _____ 1) dot
- _____ 2) exact location
- _____ 3) ordered pair
- _____ 4) quadrilaterals
- _____ 5) intersecting lines
- _____ 6) skew lines
- _____ 7) polygon
- _____ 8) right angle
- _____ 9) obtuse angle
- _____ 10) circumference
- _____ 11) diameter
- _____ 12) pyramid
- _____ 13) arc
- _____ 14) prism
- _____ 15) perpendicular lines

COLUMN B

- a) any part of the circumference of a circle
- b) an angle greater than 90° but less than 180°
- c) 3-dimensional figure with polygons as ends and parallelograms as sides
- d) a pixel
- e) lines crossing with a specific point in common
- f) lines forming a 90° angle when crossing
- g) a figure bounded by straight sides
- h) perimeter of a circle
- i) A chord passing through the center of a figure
- j) a point on the x-axis which corresponds to a point on the y axis.
- k) deviated lines
- l) a polygon with four sides and angles
- m) the point used by mapmakers
- n) a 90° angle
- o) 3-dimensional figure with polygon as base

EXERCISE 3.

Contextual reference

With reference to the text, find out what the following words refer to:

- a) their (line 6) _____
- b) all (line 8) _____
- c) it (line 12) _____
- d) they (line 20) _____
- e) they (line 23) _____
- f) those (line 42) _____
- g) their (line 36) _____

EXERCISE 4.

**Focus**

Match the words in Column A with their grammatical functions in Column B:

COLUMN A	COLUMN B
a) ordered (line 8)	1) present participle in elliptical relative phrase
b) having (line 35)	2) conditional mode
c) passing (line 46)	3) past participle as adjective
d) had (line 7)	4) simple past
e) should (line 7)	5) past participle in elliptical relative phrase
f) used (line 12)	6) past participle in passive form
g) fixed (44)	7) gerund
h) made up (line 18)	8) past participle in present perfect tense
i) intersecting (line 24)	9) past participle in past perfect tense
j) called (line 33)	10) present participle as adjective
	11) present participle in progressive form
	12) phrasal verb

EXERCISE 5.



Vocabulary study
Refer back to the text and find the synonyms and antonyms for the following words:

SYNONYMS	ANTONYMS
1) initially (para. 1) _____	6) variable (para 1) _____
2) principal (para 2) _____	7) strictly (para 1) _____
3) cross (para 2) _____	8) beginning (para 6) _____
4) unlimited (para 4) _____	9) thinness (para 4) _____
5) border (para 3) _____	10) concave (para 4) _____

EXERCISE 6.

**Sentence formation**

Put the following phrase into the tenses requested:

Mapmakers use the exact location to measure distances between cities.

- a) Present perfect affirmative _____
- b) Simple past interrogative _____
- c) Future continuous negative _____
- d) Passive conditional affirmative _____
- e) Past perfect interrogative _____

EXERCISE 7.

**Cloze test**

Fill in the spaces of this brief history of geometry using the following words:

represented, which, divided, advances, theorems, finally, concerned, in fact, could, his

Geometry is the branch of mathematics 1) _____ with the properties of space and figures in space. In ancient Egypt and Babylonia, it was used in surveying and building. The ancient Greeks realized that properties of figures 2) _____ be logically deduced from other properties; 3) _____, Euclid collected a large amount of Greek knowledge in his *Elements* 4) _____ developed geometry as a formal logical structure based on definitions and axioms, from which 5) _____ could be proved. Euclidean geometry is 6) _____ into plane geometry and solid geometry. In 1637, Descartes published 7) _____ new analytic geometry in which points could be 8) _____ by numbers, lines and curves with equations. Around the same time, analytic geometry was independently discovered by Fermat. The 19th century saw major 9) _____ in geometry, such as algebraic geometry and non-Euclidean geometries. 10) _____, Riemann forwarded a view of geometry as the study of any kind of space of any number of dimensions.

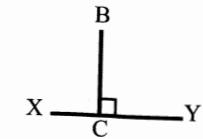
GEOMETRICAL EXERCISES

**A. Complete the descriptions of the lines and angles given below:**

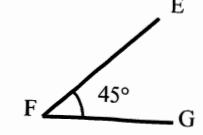
1) This line is _____.
(A _____ line.)

This line is _____.
(A _____ line.)

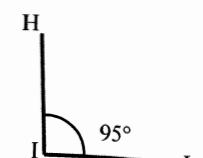
2) The line BC is _____ to the line XY.
BCY is a _____.



3) EF is _____ to FG:

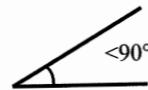


4) HIJ is _____.
ĤI is _____.
HI is _____ to IJ.



B. What kind of angles are these?

An angle $<90^\circ$ is called an _____ angle.



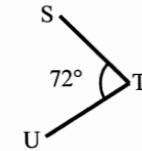
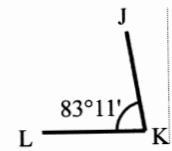
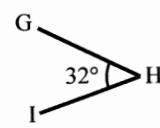
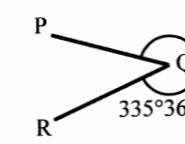
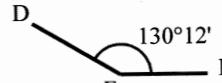
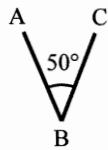
An angle $>90^\circ$ is called an _____ angle.



An angle $>180^\circ$ is called a _____ angle.

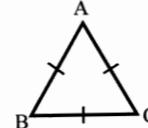


C. Completely describe these angles:

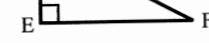


D. What sort of triangles are these?

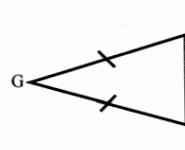
ABC is an _____ triangle.



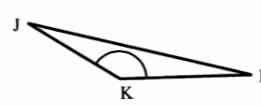
DEF is an _____ triangle.



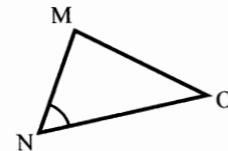
GHI is an _____ triangle.



JKL is an _____ triangle.

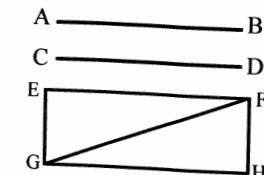


MNO is an _____ triangle.

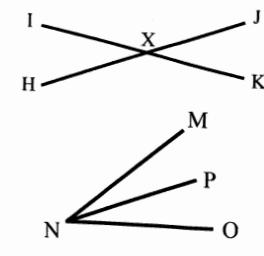


E. What sort of lines are these?

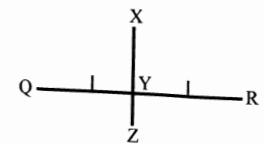
AB and CD are _____ lines



FG is a _____ line.



IK and JH are _____ lines.
Lines IK and JH _____ at X.

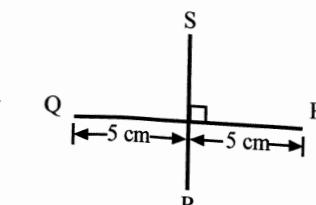
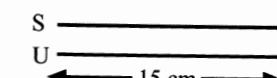
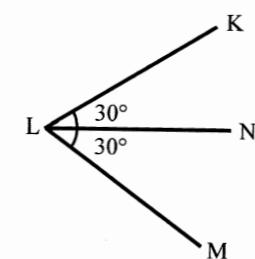
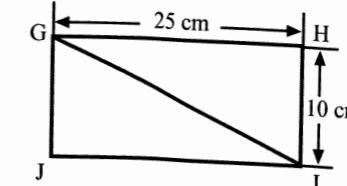
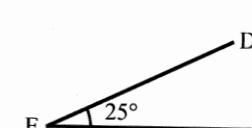
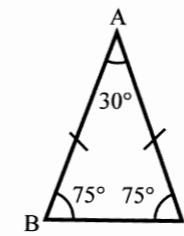


The line PN _____ the angle MNO.
PN is the _____ of the angle MNO.

The line XZ _____ the line QR at Y.
The line XZ is the _____ of line QR.

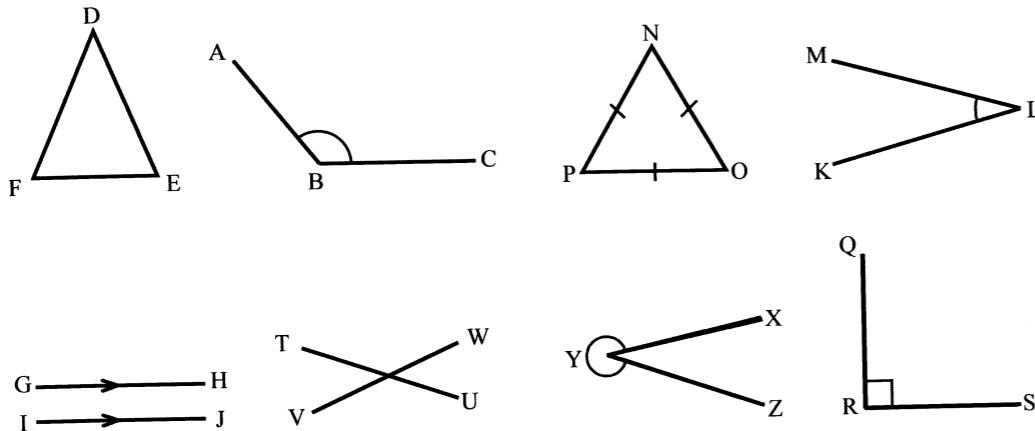
F. Describe these angles as fully as possible.

For example, ABC is an isosceles triangle which has one angle of 30° and two angles of 75° .

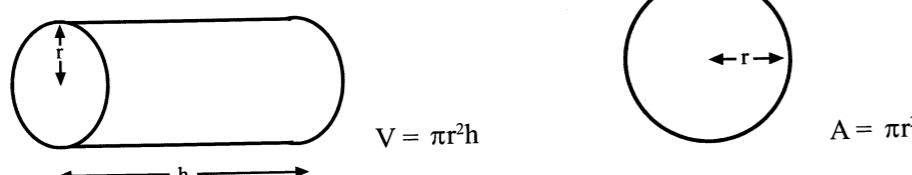
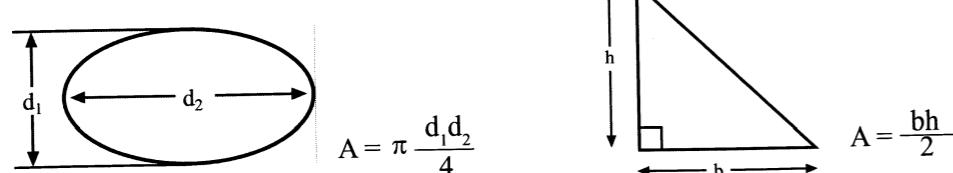
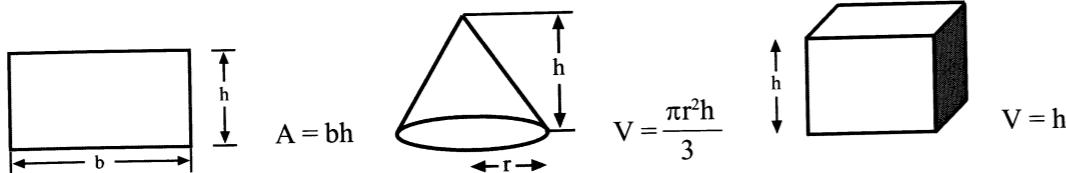


DRILLS**Drill 1**

For example: What sort of angle is ABC?
It's an obtuse angle

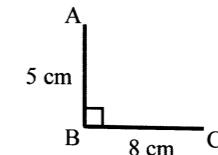
**Drill 2**

For example: What is πr^2 ?
 πr^2 is the area of a circle

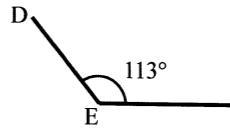
**Drill 3**

Fill in the missing words in these statements.

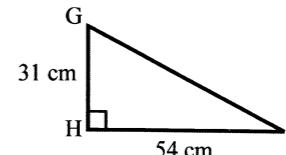
- 1) AB is a v_____ s_____ line of l_____. AB is at a r_____ a_____ to BC, which is a h_____ s_____ line of l_____ 8 cm.



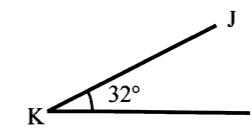
- 2) DEF is an o_____ a_____ of 113° .



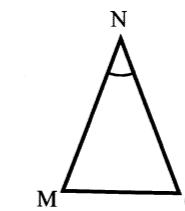
- 3) GHI is a r_____ a_____ triangle having a h_____ and a l_____ of 31 cm.



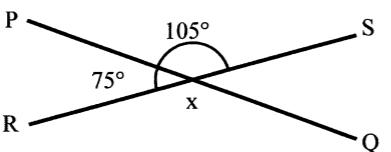
- 4) JKL is an a_____ a_____ of 32° .



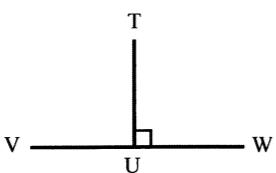
- 5) MNO is an i_____ triangle, having an angle MNO of 40° .



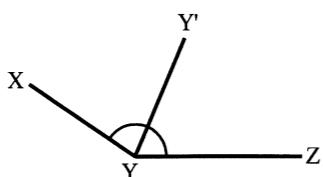
- 6) The lines PQ and RS intersect at X.
The value of the o_____ angle is 105° and that of the a_____ angle
is 75° .



- 7) The v_____ line TU is p_____ to the h_____ line VW.



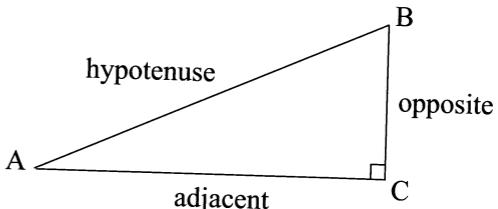
- 8) The s_____ line YY' bisects the o_____ angle at XYZ.



Lesson 5

TRIGONOMETRY

- (1) Trigonometry is a branch of mathematics that deals with the angles and sides of triangles, their relations to one another and their measurement. It is invaluable to the surveyor and draftsman and is used in all kinds of accurate calculations. This subject is applied, among other things, to building projects, surveying, civil engineering, navigation, and astronomy. It is also a powerful theoretical tool in the hands of mathematicians. The name *trigonometry* is derived from the Greek words: *trigonon* = a triangle, *metron* = measure. It is widely accepted that the true foundation of trigonometry was laid by Hipparchus, a renowned Greek astronomer.
- (2) Trigonometry is based on certain 'functions' of the relations of angles and their use in 'solving' triangles, i.e. finding unknown lengths, angles and areas, when adequate information is provided. A function is a quantity which depends on another quantity or 'variable' for its value. Any quantity that depends on an angle for its value is a function of that angle. If a right-angled triangle is constructed with an angle A at one vertex, there will be certain relations between the ratios of any two sides of this triangle and the angle A.



- (3) In any right-angled triangle, the two lines that meet at the right angle are called the sides, and the line opposite the right angle is called the hypotenuse. In the diagram, when we consider functions of the angle A, we call AC the adjacent side and BC the opposite side. The ratio of the opposite side to the adjacent side is called the tangent of the angle. The word 'tangent' is usually abbreviated to 'tan'. Hence, $\tan A = (\text{opposite side}) : (\text{adjacent side}) = BC/AC$. The inverse of this ratio, which is $(\text{adjacent side}) : (\text{opposite side})$, of AC/BC , is called the cotangent of A, which is usually shortened to $\cot A$.
- (4) The other basic trigonometrical ratios or functions are the sine, the cosine, the secant and the cosecant. The short mathematical forms of these words are sin, cos, sec and cosec. Each of these trigonometric functions has two forms, depending upon whether degrees or radians are used. In elementary work, angles are measured in degrees where one revolution measures 360 degrees. However, in more advanced work, it is essential that angles are always measured in radians. A radian is a unit of angular measurement in which the central angle of a circle is determined by an arc equal in length to the radius of the circle. Sometimes authors do not make the distinction between the functions in degrees or radians so, for example, $\cos x = \cos x^\circ$. In reality these are different functions, but are related since $\cos x^\circ = \cos(\pi x/180^\circ)$.

 **Read aloud the following relations between these functions.**

$$\begin{aligned}\tan A &= \sin A/\cos A \\ \cot A &= 1/\tan A \\ \sin^2 A + \cos^2 A &= 1 \\ 2 \sin A \cos A &= \sin 2A\end{aligned}$$

EXERCISE 1.

 **Reading for detail**

With reference to the text, indicate whether the follow statements are TRUE or FALSE.

- 1) In trigonometry, angles are measured in minutes.
- 2) A function depends on a variable.
- 3) The lines which meet at a right angle are called sides.
- 4) The tangent of an angle is the ratio between the opposite side and the hypotenuse.
- 5) The field of trigonometry was founded by the astrologer Hipparchus.
- 6) A radian is an angular measure used in basic or introductory work.

EXERCISE 2.

 **Cloze test**

Fill in the spaces of this version of the text using the following words:
at, of, it, from, between, if, their, solving, who, which

The branch of mathematics concerned with relationships existing 1) _____ sides and angles of triangles and 2) _____ measurement is called trigonometry. It includes a study of trigonometric functions and their uses in 3) _____ triangles. A function is a quantity 4) _____ depends on another quantity or variable for its value. 5) _____ a right-angled triangle is constructed with an angle A 6) _____ one vertex, there will be certain relations between the ratios of any two sides 7) _____ this triangle and the angle A. Among other things, the field of trigonometry is applied to navigation, astronomy and civil engineering; 8) _____ is also a powerful tool for mathematicians. The origin of the word comes 9) _____ the Greek language and, in fact, it was a Greek astronomer 10) _____ laid the foundation for this branch of mathematics.

EXERCISE 3.

 **Question formation**

With reference to the text, formulate questions to the following answers using **question words**, such as **who, when, why, where, what, how, how many**, etc.

- a) The draftsman and surveyor.
- b) It is a quantity which depends on another quantity or variable for its value.
- c) He was a renowned Greek astronomer.
- d) It is opposite the right angle.
- e) It is a unit of angular measurement.
- f) A trigonometric function has two forms.

EXERCISE 4.

 **Word formation (A)**

Complete the chart with the part of speech requested for the following words:

NOUN	ADJECTIVE	VERB	ADVERB
suitability	variable	control	
attraction	different	change	needfully conclusively
consideration		notice	
expectant		obtain	

Now, form adjectives from the following nouns:

essence	angle
structure	line
crisis	circle
substance	pole
horizon	nucleus
experiment	sun
symmetry	analogy

EXERCISE 5.

 Sentence formation

Transform the following phrase into the tenses requested:

The scientific press devoted many articles to its description.

Present passive _____
 can + passive _____
 Past passive _____
 Past progressive passive _____
 Present perfect passive _____
 Conditional passive _____
 must + passive _____

EXERCISE 6.

 Word formation (B)

Complete the chart with the following parts of speech requested and their translation.

ADJECTIVE	VERB	TRANSLATION	NOUN	TRANSLATION
hot				
warm				
weak				
cold				
deep				
high				
long				
wide				
thick				
strong				
tough				
soft				
hard				
smooth				
rough				

Lesson 6

MATHEMATICAL STATISTICS

- (1) The extraction of knowledge from large masses of data can be accomplished by mathematics. One of the simplest mathematical devices is the **average**. Suppose that the employees of a small business firm receive the following weekly salaries in dollars: 20, 30, 40, 50, 50, 50, 60, 70, 80, 90, 100, 1000, 2000. What is the average weekly salary? Usually we would take the sum of all these salaries and divide it by the number of salaries. In this example the sum is 3,640 and the number of salaries is 13. Hence, the average is 280. This type of average is called the arithmetic **mean**. It is clear that this mean is not very informative. No single person actually earns this salary. Moreover, out of thirteen people, only two earn as much or more. The others earn far less. In other words, the arithmetic mean is not a representative figure if some of the quantities included are very large compared to the others.
- (2) Another frequently used average is the **median** or measure of centrality i.e. the figure for which there is an equal number of cases below and above it when arranging observations in ascending order. In our example there are thirteen cases and therefore, the median salary is 60 because there are six people earning less and six earning more. The median seems to be a more representative figure, but it too, fails to tell the whole story. If the wages of the six people below the median were much less than the above figures, and the wages of the six above the median were much higher, the median would be the same. Such a gross disparity in earning would not be reflected in the median figure of 60. Thus, also the median is often not a representative figure.
- (3) Another average in common use is the **mode**. This is the figure among the data that is the most frequent. In our example, the mode of the salaries is 50 because the largest number of people earn this salary. However, even though it gives some indication of the salary distribution, it may be inadequate.
- (4) Each of these averages fails to illustrate the distribution of data above and below it. What is needed is some indication of the data dispersion around the average. For this purpose, statisticians use a quantity called the **standard deviation** which is denoted σ (sigma). Briefly stated, the standard deviation of a set of data is the square root of the mean of the squares of the individual deviations from the mean of the data.
- (5) Even two representative figures such as the mean and standard deviation do not say as much as the data themselves, although they can be helpful. An alternative to remembering the entire set of data or to using these representative figures is a graph using the **Cartesian coordinate system**. Anyone who reads a daily newspaper has observed that a graphical presentation of data makes facts stand out that otherwise would be far from obvious. Graphs of the rise and fall of the cost of living or stock market rates are common examples. This graphical approach to data, however, has provided results far more important than a simple rise or fall, increase or decrease. For instance, if we plotted the heights of men as the abscissa (x-axis) and their corresponding frequencies as the ordinate (y-axis), we would obtain the graphic distribution of these frequencies which is called the normal frequency curve or normal distribution (Gaussian distribution). Due to the symmetry of the graph

resulting from a normal frequency curve (bell curve), the mode, median and mean coincide. The importance of the distribution lies in the fact that many experiments produce data that are approximately normally distributed. Therefore, in addition to its key role in the normal distribution, it can be used to make inferences regarding variables in a non-normal population.

45

EXERCISE 1. **Reading for detail**

Decide whether the following statements are true or false by referring to the text. If **TRUE**, put a cross on "T" and give a **full numerical line reference**; if **FALSE**, put a cross on "F" and **rewrite the statement given in the exercise** to make it true.

a) The Gaussian distribution produces a bell curve in which only the mode and mean coincide.

"T" Line reference _____

"F" Corrected statement _____

b) The normal frequency curve is also used for making deductions concerning variables in a non-normal population.

"T" Line reference _____

"F" Corrected statement _____

c) The arithmetic mean is calculated by multiplying the sum of the data by the total number of data.

"T" Line reference _____

"F" Corrected statement _____

d) The average is the number which most frequently occurs in a sample.

"T" Line reference _____

"F" Corrected statement _____

e) The median is the number for which there is an equal number of observations above and below it.

"T" Line reference _____

"F" Corrected statement _____

f) The mode provides evidence of the dispersion of data around the average.

"T" Line reference _____

"F" Corrected statement _____

g) The standard deviation is calculated by the cube root of the mean of the squares of the individual similarities from the mean.

"T" Line reference _____

"F" Corrected statement _____

h) Data represented in the form of a graph impedes the comprehension of facts.

"T" Line reference _____

"F" Corrected statement _____

EXERCISE 2. **Linking words**

With reference to the text, provide the translation in Column B and function in Column C of the following linking words.

COLUMN A

- a) _____ hence (line 6)
- b) _____ moreover (line 8)
- c) _____ in other words (line 9)
- d) _____ however (line 23)
- e) _____ therefore (line 44)
- f) _____ due to (line 40)
- g) _____ for instance (line 37)
- h) _____ although (line 31)

COLUMN B

COLUMN C

- 1) contrasting
- 2) giving example
- 3) time sequence
- 4) listing
- 5) cause and effect
- 6) defining
- 7) adding information
- 8) comparing

EXERCISE 3. **Focus**

With reference to the text, match the words in Column A with their grammatical functions in Column B.

COLUMN A

- 1) included (line 10)
- 2) using (line 32, first)
- 3) representative (line 10)
- 4) observed (line 33)
- 5) corresponding (line 38)
- 6) resulting (line 41)
- 7) called (line 27)
- 8) ascending (line 14)
- 9) anyone (line 33)
- 10) what (line 4)
- 11) simplest (line 2)
- 12) using (line 32, second)

COLUMN B

- a) present participle as adjective
- b) present participle in elliptical relative phrase
- c) superlative form
- d) quantitative pronoun
- e) past participle as adjective
- f) past participle in passive form
- g) past participle in elliptical relative phrase
- h) question word
- i) comparative form
- j) relative pronoun
- k) present participle in progressive form
- m) quantitative adjective
- n) adjective-forming suffix
- o) gerund
- p) past participle in present perfect tense
- q) noun-forming suffix

EXERCISE 4. **Contextual reference**

With reference to the text, find out what these words refer to:

- a) one (line 2) _____
- b) it (line 5) _____
- c) two (line 9) _____
- d) others (line 11) _____
- e) it (line 13) _____
- f) it (line 23) _____
- g) its (line 43) _____

EXERCISE 5. **Phrasal verb "take"**

Complete the sentences with one of the following prepositions:

after, back, down, in (2), off, on, out on, over, up (3)

- 1) If you don't believe me, you can take the matter ____ with the railway company.
- 2) I'll take ____ your name and address and you can pay the company later.
- 3) It's no use taking it ____ the ticket collector. He doesn't make the rules.
- 4) We ought not to take ____ the poor man's time. He's busy.
- 5) You can see from his nose that he takes ____ his father.
- 6) The plane is just going to take ____.
- 7) He's far too busy to take ____ any more work.
- 8) His company has been taken ____ by a larger firm.
- 9) If you speak slowly and clearly, the students will take ____ the meaning.
- 10) I'm going to take ____ golf next year.
- 11) When I visited Farley again, it took me ____ to my childhood.
- 12) I'm afraid you've been taken _____. This pound note is not genuine.

EXERCISE 6. **Word forms**

Choose the appropriate form of the words to complete the sentences. (You may need to add an "s" to form the 3rd person singular of the verb or for a plural noun.)

1) divide, division, divisor, dividing, divided, divisible

- a) It is often difficult for students to _____ their time between studying and relaxing.
- b) Are all numbers _____ by three?
- c) There is always a _____ of labor within a factory.

2) calculate, calculator, calculating, calculated, calculation, calculus

- a) A computer can perform many kinds of _____ quickly and accurately.
- b) _____ is a branch of mathematics for making _____ without the use of a _____.
- c) It is practically impossible to _____ the speed at which a computer executes a mathematical problem.

3) addition, add, added, adding, additional, additionally, additive

- a) _____ and subtraction are two basic mathematical operations.
- b) When buying a new car, often there is no _____ charge for service.
- c) Fractions can be _____ by finding a common denominator and then _____ the numerators.

4) measurement, measure, measured, measurable, measuring

- a) The number of employees in a particular company can often be used as a _____ of its success.
- b) In mathematics, various types of _____ may be defined.
- c) More refined techniques of _____ have followed the evolution of man.

5) difference, differ, different, differently, differential, differentiate

- a) There are many _____ computer manufacturers today, and a buyer must be able to _____ between the advantages and disadvantages of each.
- b) The opinions of mathematicians regarding the best way of solving a problem often _____ greatly.
- c) A solution of a _____ equation is a function that, when substituted for the dependent variable in the equation, leads to an identity.
- d) The value which is obtained by subtraction is called the _____.

EXERCISE 7. **Conditional "IF" clauses**

Indicate the type of conditional phrase for the following sentence, and transform it into the other two conditional types.

- 1) If we plotted the heights of men and their corresponding frequencies, we would obtain the graphic distribution.

(Type _____)

(Type _____)

(Type _____)

- 2) He's only nineteen but he wants to leave school at the end of the term. If he (leave) now he (be) sorry afterwards.

(Type _____)

(Type _____)

(Type _____)

STUDENT NOTES

Lesson 7

TABLES AND GRAPHS

TABLES

Tables are often used in reports, magazines, and newspapers to present a set of numerical facts. They enable the reader to make comparisons and to draw quick conclusions. One of the main purposes of tables is to make complicated information easier to understand. The advantage of presenting data in a table such as the one in the example that follows is that you can see the information at a glance.

When answering questions based on tables, carefully read the table title and the column headings. The table title gives you a general idea of the type and often the purpose of the information presented. The column headings tell you the specific kind of information given in that column. Both the table titles and the column headings are usually very straightforward. After all, the table is supposed to make it easy for you to grasp this information. So, in a column headed "Hourly Wage", you can expect to find just that—a list of hourly wages. You do have to be careful, however, to choose the appropriate column from which to get the information you need and to take note of the units that are used.

With reference to the Table on Infant Deaths, which of the following answers are correct and why?

- 1) What percent of the babies born in the U.S. in 1947 died before the age of 1 year?
(A) 3.22 (B) 4.7 (C) 26.7 (D) 32.2 (E) 47
- 2) Which state had the most infant deaths in 1940?
(A) California
(B) New Mexico
(C) New York
(D) Pennsylvania
(E) Texas
- 3) Which of the following statements can be inferred from the table?
I. In 1950 less than 1/20 of the babies born in the U.S. died before the age of 1 year.
II. The number of infant deaths in the U.S. decreased from 1945 to 1950.
III. More than 5% of the infant deaths in the U.S. in 1950 occurred in California.
IV. The number of infant deaths in North America in 1959 was less than 150,000.

- A. I only.
 - B. II only
 - C. I and III only
 - D. I, III IV only
 - E. I, II, III, IV

**INFANT DEATHS (UNDER 1 YEAR OF AGE) AND RATES PER 1,000 LIVES
BIRTHS, BY STATES: 1940 TO 1950**

STATE	NUMBER OF INFANT DEATHS					RATE PER 1,000 LIVE BIRTHS				
	1940	1947	1948	1949	1950	1940	1947	1948	1949	1950
United States	110,984	119,173	113,169	111,531	103,825	47.0	32.2	32.0	31.3	29.2
Alabama	3,870	3,301	3,228	3,345	3,044	61.5	37.5	37.8	39.6	36.8
Arizona	983	973	1,083	1,034	953	85.5	50.8	56.4	51.0	45.8
Arkansas	1,810	1,445	1,363	1,539	1,209	47.0	29.5	28.4	33.7	26.5
California	4,403	7,233	6,885	6,574	6,115	39.2	29.4	28.6	26.8	25.0
Colorado	1,270	1,234	1,267	1,153	1,167	60.4	37.5	38.4	35.1	34.4
Connecticut	868	1,150	1,026	943	886	34.0	25.2	24.3	23.1	21.8
Delaware	217	239	214	224	235	47.7	31.0	29.5	30.4	30.7
District of Columbia	554	691	531	576	603	49.3	31.9	25.5	29.1	30.4
Florida	1,818	2,285	2,103	2,088	2,078	53.8	38.2	35.3	33.8	32.1
Georgia	3,744	3,251	3,169	3,101	3,064	57.8	34.2	34.2	33.3	33.5
Idaho	506	487	481	431	434	42.9	29.4	29.8	27.0	27.1
Illinois	4,398	5,672	5,123	5,195	4,868	35.3	28.9	27.7	27.4	25.6
Indiana	2,595	2,949	2,760	2,746	2,520	42.1	30.6	29.8	29.1	27.0
Iowa	1,636	1,817	1,610	1,591	1,555	36.5	28.5	26.6	25.7	24.8
Kansas	1,106	1,251	1,151	1,136	1,130	38.3	28.1	26.9	25.9	25.7
Kentucky	3,387	2,971	3,073	3,139	2,616	53.1	37.1	39.8	41.2	34.9
Louisiana	3,268	2,773	2,779	2,810	2,639	64.3	37.2	37.9	37.2	34.6
Maine	810	853	706	713	650	53.2	35.7	32.0	32.5	30.9
Maryland	1,590	1,794	1,537	1,636	1,465	49.1	31.6	28.8	30.5	27.0
Massachusetts	2,458	3,027	2,613	2,347	2,240	37.5	28.1	26.8	24.5	23.3
Michigan	4,032	5,080	4,639	4,545	4,230	40.7	31.5	30.0	28.9	26.3
Minnesota	1,758	2,165	1,959	1,893	1,889	33.2	28.6	26.9	25.6	25.1
Mississippi	2,869	2,448	2,474	2,631	2,385	54.4	36.8	37.9	39.6	36.7
Missouri	2,885	2,929	2,585	2,563	2,510	46.9	32.5	30.3	30.0	29.2
Montana	537	484	461	457	441	46.5	32.1	30.7	29.7	28.2
Nebraska	792	894	835	761	796	36.0	27.8	26.8	24.1	25.0
Nevada	109	134	147	118	139	51.7	33.2	39.8	32.1	37.9
New Hampshire	341	399	361	333	282	40.9	30.1	29.1	27.9	24.5
New Jersey	2,121	2,965	2,585	2,534	2,467	35.5	27.9	26.5	26.0	25.2
New Mexico	1,488	1,379	1,438	1,408	1,211	100.6	67.9	70.1	65.1	54.8
New York	7,297	9,123	8,258	7,878	7,429	37.2	28.2	27.3	26.1	24.7
North Carolina	4,631	3,938	3,858	4,113	3,674	57.6	34.9	35.3	38.1	34.5
North Dakota	593	523	487	517	453	45.1	30.6	29.4	30.7	26.6
Ohio	4,744	5,817	5,693	5,315	4,990	41.4	29.5	30.5	28.1	26.8
Oklahoma	2,238	1,733	1,731	1,531	1,514	49.9	32.3	34.4	30.8	30.2
Oregon	585	895	897	869	812	33.2	24.7	25.5	24.6	22.5
Pennsylvania	7,404	7,741	6,442	6,567	6,126	44.7	31.1	28.4	29.2	27.6
Rhode Island	410	522	444	395	450	37.9	28.2	26.3	24.0	27.8
South Carolina	3,042	2,352	2,331	2,283	2,220	68.2	39.5	40.4	39.0	38.6
South Dakota	466	511	525	448	473	38.7	30.9	32.0	26.0	26.6
Tennessee	2,954	3,144	3,098	3,331	2,961	53.5	36.3	37.7	40.2	36.4
Texas	8,675	8,161	9,131	8,628	7,630	68.3	41.1	46.2	42.7	37.4
Utah	539	545	568	535	503	40.4	25.1	27.4	25.3	23.7
Vermont	309	303	271	301	221	44.5	31.2	28.9	32.4	24.5
Virginia	3,335	3,142	3,163	3,162	2,836	58.5	36.6	38.5	38.1	34.6
Washington	992	1,643	1,537	1,530	1,522	35.2	28.1	27.5	27.1	27.3
West Virginia	2,269	2,091	2,108	2,082	1,822	53.7	38.0	40.2	39.6	36.1
Wisconsin	2,046	2,476	2,148	2,202	2,121	37.3	29.5	26.3	26.5	25.7
Wyoming	232	249	293	280	247	44.7	34.0	39.5	37.4	32.5

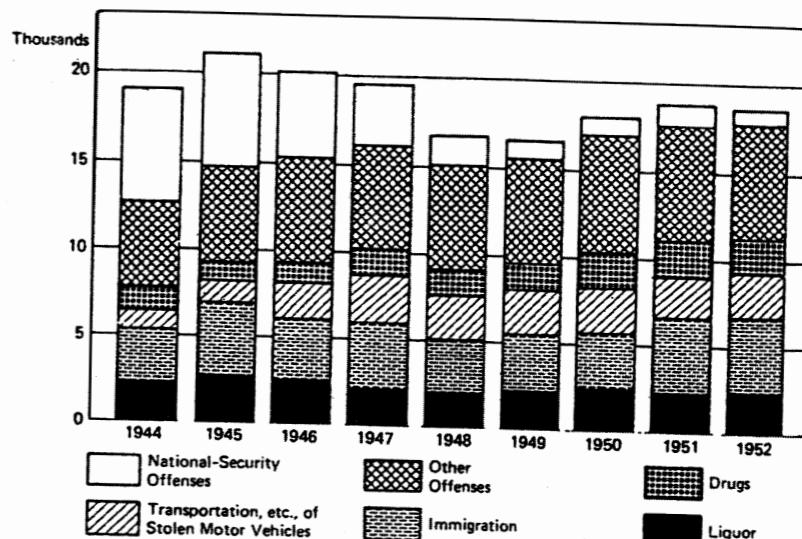
Source: Department of Health, Education, and Welfare, Public Health Service, National Office of Vital Statistics; annual report, *Vital Statistics of the United States*.

Source: Statistical Abstract of the U.S. 1957

Cumulative Graphs

You can compare several categories by a graph of the cumulative type. These are usually bar or line graphs where the height of the bar or line is divided up proportionately among different quantities.

FEDERAL PRISONERS RECEIVED FROM THE COURTS,
BY MAJOR OFFENSE GROUPS: Years 1944-1952



Source: Statistical Abstract of the U.S. 1953

Which of the following answers are correct and why? State the reason why you eliminated the other choices.

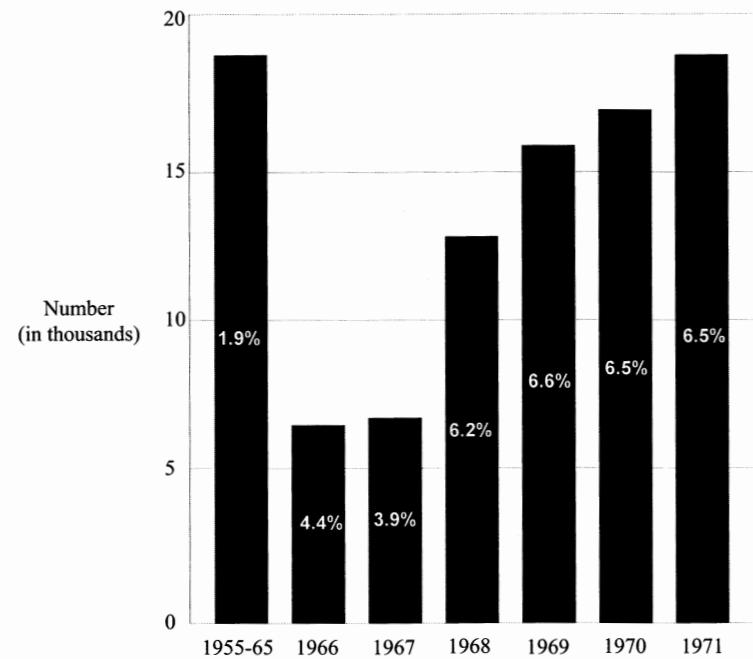
Bar Graphs

Quantities can be compared by the height or length of a bar in a bar graph. A bar graph can have either vertical or horizontal bars. You can compare different quantities of the same quantity at different times. Use your pencil or a piece of paper to compare bars which are not adjacent to each other.

- 2) Between 1955 and 1965, about how many clients were rehabilitated by State vocational rehabilitation agencies?

DISABILITY BENEFICIARIES REPORTED AS REHABILITATED:

Number, as percent of all rehabilitated clients
of State vocational rehabilitation agencies,
Years 1955-1971.



Source: Social Security Bullettin

Which of the following answers are correct and why? State the reason why you eliminated the other choices.

- 1) Between 1967 and 1971, the largest number of disability beneficiaries was reported as rehabilitated in the year:

STUDENT NOTES

Lesson 8

CLASSIFIED ADVERTISEMENTS-POSITION AVAILABLE

I MARYLAND

JOHNS HOPKINS UNIVERSITY
Department of Mathematics

The analysis group at Hopkins does research in linear and nonlinear partial differential equations with applications to geometric and physical problems. We are seeking a senior analyst with broad interests in linear and nonlinear PDE and its applications to complement our current research interests. More specifically, some of the fields of expertise that are of interest to us include harmonic analysis, microlocal analysis and geometric analysis. Outstanding research credentials and excellence in teaching are required. Minority and women candidates are encouraged to apply. The Johns Hopkins University is an Affirmative Action/Equal Opportunity Employer. Applicants should submit a curriculum vitae and list of references or arrange for letters of recommendation to be sent to: Appointments Committee, Dept. of Mathematics, 404 Krieger Hall, Johns Hopkins University, Baltimore, MD 21218. Decisions will be made anytime after September 10.

II HONG KONG

THE UNIVERSITY OF HONG KONG
Lectureship in Mathematics

Applications are invited for a lectureship (RF-94/95-73) in the Department of Mathematics, tenable from 1 September 1995. Appointment will be made, subject to the availability of funding, on a three-year, fixed-term basis. Applicants should normally have a Ph.D. degree, relevant teaching, and research experience, and be able to reinforce the research strength of the department in operations research and optimization. Applicants are requested to approach not more than three referees who are able and willing to comment on their suitability for the post in question and to request that these confidential references be sent directly to the Appointments Unit by the closing date. Annual salary (nonsuperannuable but attracting 15% (taxable) terminal gratuity) is on an 11-point scale, with starting salary depending on qualifications and experience: HK\$412,980-HK\$689,880 (approximately US\$ 53,634-US\$89,595/C\$ 73,746-C\$ 123,193, US dollar/Canadian dollar equivalents as of 12 April 1995). At current rates salaries tax will not exceed 15% of gross income. Children's education allowance, leave, and medical benefits are provided; housing or tenancy allowances are also provided in most cases at a charge, of a percentage of salary, currently 7.5%. Further particulars and application forms may be obtained from the Appointments Unit, Registry, The University of Hong Kong, Hong Kong (fax: 852-2559-452058; APPTUNIT@HKUVM1.HKU.HK). Particulars are also available on the University's listserv accessed by e-mail as listserv@hkuvvm1.hku.hk (specify "get apptment filelist" for list of vacant posts). Closes 10 July 1995.

III THE CHINESE UNIVERSITY OF HONG KONG

The University (founded 1963) offers comprehensive programmes up to Ph.D. level in the humanities, business administration, education, engineering, medicine (including nursing and pharmacy), science, and social science (including architecture). Student enrollment is around 11,500 full-time in 1994-95. The University is very active in promoting research and consultancies and in liaising with industry and the business sector worldwide. English and/or Chinese are used in teaching and administration.

Applications are invited for Senior lecturer/lecturer, Department of Mathematics (Ref. 95/027(576)/2). Candidates should preferably be specialized in analysis (functional analysis, geometric analysis)/scientific computation. Applicants from other fields with outstanding publications are also encouraged to apply. The appointee should be able to interact with other members of the department. The post will be tenable in January 1996. Appointment will be made for one year in the first instance; renewable subject to funding.

Annual Salary and Fringe Benefits
Senior lecturer: HK\$641,580-861,900 by 8 increments
Lecturer: HK\$412,980-689,880 by 10 increments
(approx. exchange rate in April 1995: US\$ 1=HK\$7.8; £1=HK\$12.3). Starting salary and grade will be commensurate with qualifications and experience. Benefits include leave with full pay, medical and dental care, education allowance for children, housing benefit for eligible appointee (with appointee contributing 7.5% of salary towards the provision of housing), and contract-end gratuity as appropriate.

Application Procedure
Send full résumé in duplicate, including a recent photograph, and names and addresses of three referees, with copies of academic credentials (in duplicate) and recent publications to the Personnel Office, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong (Fax: 852-2603-6852) before August 15, 1995. Please quote the appropriate reference no. and mark "Recruitment" on cover.

IV INDIA

THE MEHTA RESEARCH INSTITUTE OF MATHEMATICS AND MATHEMATICAL PHYSICS 10, Kasturba Gandhi Marg (Old Kutchery Road) Allahabad-211 002 (India).

Applications are invited for various academic positions in the Institute, including visiting positions, from exceptionally talented candidates in the fields of mathematics and mathematical physics. Demonstrated ability to carry out independent research is expected of the applicants. Interested candidates should send complete, bio-data together with a list of publications and a few selected reprints so as to reach the director of the Institute at the aforementioned address (e-mail: mani@mri.ernet.in) by July 31, 1995. Two or three letters of recommendation should also be arranged.

EXERCISE 1.

 **Reading for detail**

Decide whether the following statements are true or false by referring to the text. If **TRUE**, put a cross on "T" and give a full numerical line reference; if **FALSE**, put a cross on "F" and rewrite the statement given in the exercise to make it true.

a) The Johns Hopkins University does not accept personnel with disabilities.

"T" Line reference _____

"F" Corrected sentence _____

b) No prior teaching experience is necessary for candidates applying to the Johns Hopkins University.

"T" Line reference _____

"F" Corrected sentence _____

c) September 10 is the deadline for decisions to be made about recruitment for the Johns Hopkins University.

"T" Line reference _____

"F" Corrected sentence _____

d) Three letters of reference are sufficient for the candidates applying for lectureship at the University of Hong Kong.

"T" Line reference _____

"F" Corrected sentence _____

e) The last day to file an application for the position at Hong Kong University is July 10, 1995.

"T" Line reference _____

"F" Corrected sentence _____

f) All fringe benefits at Hong Kong University are offered without cost in most cases.

"T" Line reference _____

"F" Corrected sentence _____

g) One copy of a complete C.V. must be sent to the personnel office of the Chinese University of Hong Kong.

"T" Line reference _____

"F" Corrected sentence _____

h) The Chinese University of Hong Kong gives much importance to its relationship with industrial and commercial sectors.

"T" Line reference _____

"F" Corrected sentence _____

i) The beginning salary of the candidate will correspond to the qualifications and experience at the Chinese University of Hong Kong.

"T" Line reference _____

"F" Corrected sentence _____

j) A list of the candidate's scientific publications should be included in the application to the Mehta Research Institute.

"T" Line reference _____

"F" Corrected sentence _____

k) Positions are available at the Mehta Research Institute for visiting professors.

"T" Line reference _____

"F" Corrected sentence _____

EXERCISE 2.

 **Vocabulary study**

Match the words in Column A with their closest meaning in Column B.

COLUMN A

- _____ a) humanities (text III)
- _____ b) PhD (text II)
- _____ c) leave (text II)
- _____ d) lecturer (text III)
- _____ e) contract-end gratuity (text III)
- _____ f) enrollment (text III)
- _____ g) liaising (text III)
- _____ h) minorities (text I)
- _____ i) recruitment (text III)
- _____ j) credentials (text I)
- _____ k) recommendation (text IV)
- _____ l) fringe benefits (text III)
- _____ m) résumé (text III)
- _____ n) tenable (text III)

COLUMN B

- 1) certificates of previous experience
- 2) curriculum vitae
- 3) search for personnel
- 4) extra benefits in addition to wages
- 5) authorized absence
- 6) available
- 7) highest academic title
- 8) lowest teaching level
- 9) creating contacts
- 10) inscription
- 11) groups of people often discriminated against
- 12) cultural studies
- 13) terminal sum of money
- 14) references

EXERCISE 3.

 **Focus**

With reference to the texts on **Maryland** and **India**, match the following words in Column A with their grammatical function in Column B.

COLUMN A

- _____ a) outstanding (line 9)
- _____ b) teaching (line 10)
- _____ c) seeking (line 4)
- _____ d) sent (line 15)
- _____ e) should (line 13)
- _____ f) including (line 89)
- _____ g) talented (line 90)
- _____ i) expected (line 92)

COLUMN B

- 1) past participle as adjective
- 2) past participle in elliptical relative phrase
- 3) past participle in passive form
- 4) present participle as adjective
- 5) present participle in elliptical relative phrase
- 6) present participle in progressive form
- 7) gerund
- 8) conditional form of modal verb
- 9) passive infinitive
- 10) present infinitive

EXERCISE 4.

 Sentence formation

Put the following phrase into the tenses requested.

The analysis group at the university does research in differential problems.

- a) Simple past interrogative _____
- b) Future progressive affirmative _____
- c) Past passive affirmative _____
- d) Present perfect interrogative _____
- e) Present conditional _____

EXERCISE 5.

 Word forms

Choose the appropriate form of the words to complete the sentences. (You may need to add an 's' for the 3rd person singular of the verb or for a plural noun).

1) appoint, appointed, appointee, appointive, appointment, appointing

- a) The director will _____ a new organizing committee.
- b) A new manager has been _____ recently.
- c) The new _____ is expected to be able to interact with other members of the department.
- d) The mathematics department is offering a yearly _____ to talented candidates.

2) applicant, apply, applying, applicable, application, applied

- a) _____ are invited for various academic positions in the institute.
- b) Organization of independent research is expected of the _____.
- c) Persons without the necessary experience for the position should not _____.
- d) The new technology was _____ to farming.
- e) Much of the information was not _____ to students.

3) including, inclusive, include, inclusion, inclusively

- a) The résumé, _____ three references, must be sent before April 10.
- b) The tour _____ a visit to the Science Museum.
- c) The _____ fare is \$845.75.

EXERCISE 6.

 Word formation

With reference to the text

University of Hong Kong, match the suffixes of the words in Column A with the part of speech in Column B.

COLUMN A

- _____ a) lectureship
- _____ b) normally
- _____ c) tenable
- _____ d) suitability
- _____ e) qualification
- _____ f) confidential
- _____ g) appointment
- _____ h) experience
- _____ i) specify

COLUMN B

- 1) noun
- 2) verb
- 3) adjective
- 4) adverb

STUDENT NOTES

Lesson 9
TEXT BOOKS

1

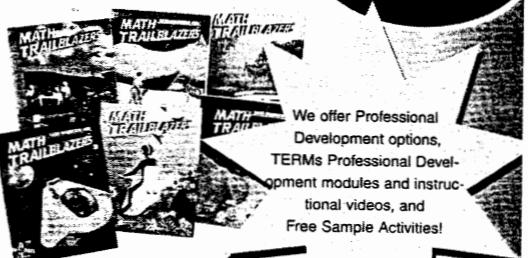
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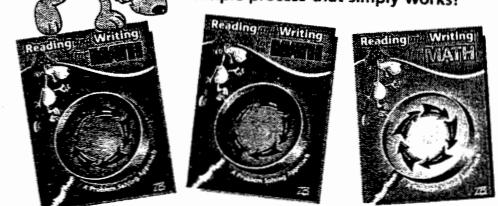
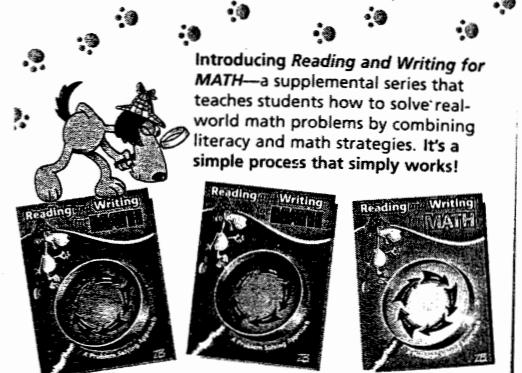


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2

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3

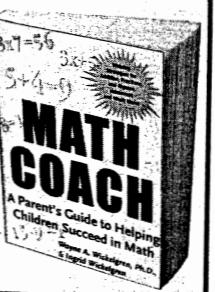
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5



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NAVIGATING THROUGH ALGEBRA IN GRADES 6–8 c)

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NAVIGATING THROUGH ALGEBRA IN GRADES 9–12 d)

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6

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7

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EXERCISE 1.

Matching information

Match the following phrases in Column A with the appropriate advertisement for books, seminars, or foundations in Column B.

COLUMN A

- 1) _____ A series of algebra books for grades 2 through 12.
- 2) _____ Published by Kendall/Hunt
- 3) _____ Based in Fresno, California
- 4) _____ A book for parents to help their children succeed in Math.
- 5) _____ A sample copy of the book is available
- 6) _____ A summer seminar offering new ideas for K-8 teachers of Math
- 7) _____ To be held on July 28 to August 9, 2002.
- 8) _____ An educational foundation which organizes workshops
- 9) _____ A series of books aimed at increasing the scores in Math tests
- 10) _____ A series of electronic textbooks for math students
- 11) _____ A series of books for reading and writing math specifically for elementary school students

COLUMN B

- a) Math coach - a guide to help parents help their children
- b) Summermath for teachers - a summer seminar for stimulating new ideas in teachers
- c) AIMS - workshops for state-employed teachers
- d) Mathmedia - electronic math textbooks
- e) Zaner-Bloser - series of children's textbooks with practical problems
- f) Trailblazers - publishers of math Textbooks and teaching material
- g) Navigating through Algebra-series presenting algebraic elements for all school grades

EXERCISE 2.

Sentence formation

Put the following sentence into the tenses and forms requested.

Every child has the potential for success in Math.

- 1) Future interrogative _____
- 2) Present perfect affirmative _____
- 3) Simple past negative _____
- 4) Present conditional affirmative _____

EXERCISE 3.**Focus**

Match the following words in Column A with their grammatical functions in Column B. The numbers refer to the particular text.

COLUMN A	COLUMN B
1) call (4)	a) gerund
2) learning (7)	b) progressive form
3) earliest (5)	c) possessive case
4) combining (2)	d) past participle as adjective
5) achieved (1)	e) present participle as adjective
6) introduced (5)	f) past participle in present perfect tense
7) should (5)	g) present participle in elliptical relative phrase
8) leading (1)	h) past participle in elliptical relative phrase
9) student's (5d)	i) imperative mode
10) falling (3)	j) past participle in passive form
11) gained (7)	k) conditional form
	l) superlative form
	m) comparative form
	n) simple past tense

EXERCISE 4.**Vocabulary study**

Choose the most appropriate synonym to define these words taken from the Math texts.
The numbers refer to the particular test.

a) grappled (7) i) comprehended	ii) ignored	iii) battled
b) hands-on (4) i) handwriting	ii) direct experience	iii) applause
c) clues (2) i) suggestions	ii) obstacles	iii) societies
d) trailblazer (1) i) path	ii) traveler	iii) pioneer
e) coach (3) i) coat	ii) code	iii) teacher
f) cornerstone (5) i) foundation	ii) intersection	iii) corporation
g) mastered (7) i) forgot	ii) controlled	iii) learned

EXERCISE 5.**Question formation**

With reference to the texts, formulate questions for which the following would be appropriate answers using the question words, such as Who, What, Where, How, etc.

1) It is 800-542-6657.

2) Dr. Wayne A. Wickelgren is the author.

3) It is P.O. Box 8120, Fresno, Calif.

4) By calling 1-800-421-3018

5) It is in the state of Massachusetts.

6) To increase your test results.

7) It is from July 28 to August 9, 2002.

EXERCISE 6.**Phrasal verb "go"**

Complete the sentences with "go" and one of the following prepositions:
about, back on, for, in for, off (2), on (4), round, through, through with, with, without (2)

1) The police had no information to go _____ so they could not arrest him.

2) The old lady opened the window and asked what was going _____.

3) The same rule goes _____ everyone in this hotel.

4) I don't think I could go _____ another night in that hotel.

5) It's not good for your health to go _____ food at the proper time.

6) The wedding went _____ splendidly.

7) This milk has gone _____. We'll have to throw it away.

8) That's not the way to go _____ the job. Let me show you how to do it.

9) I'm going _____ the Cambridge examination this summer.

10) He went _____ working although he was tired.

11) He congratulated the bride and bridegroom and then went _____ to thank the guests for coming.

12) There wasn't enough coffee to go _____ so I had to go _____.

13) You shouldn't have gone _____ your promise.

14) I was pleased that Ian and Virginia had finally decided to go _____ their wedding after being engaged for so long.

15) That tie goes beautifully _____ your suit.

EXERCISE 7.

 Word forms

Choose the appropriate form of the words to complete the sentences. (You may need to add an 's' for the 3rd person singular of the verb or for a plural noun).

1) location, locate, located, local, locality

- a) We hope your holiday will be spent in a serene _____.
- b) After the explosion, a great anxiety spread among the people living in the same _____.
- c) The film was shot on _____ in Prague.
- d) If you _____ him, please call me.

2) modify, modifier, modification, modified

- a) An adjective _____ a noun.
- b) The present government _____ its approach to the problem.
- c) The chairman felt that the proposal might need _____.

3) correction, correct, corrected, corrective, correcting, correctly

- a) I hope you pronounced his name _____.
- b) That is the _____ answer.
- c) I wish to _____ a mistake on this subject which appeared in the newspaper.
- d) Please make the necessary _____ and forward the letter to the director.
- e) When we put the _____ optics on the camera, that will solve the problem.

Lesson 10

A HISTORY OF ZERO

- (1) Who discovered zero? Actually, this question is quite difficult to answer because Zero makes many vague appearances throughout history only to vanish again as if mathematicians did not recognize its fundamental significance.
- (2) The first thing to say about zero is that there are two uses of zero which are both extremely important but different. One use is the empty space indicator in our place-value system. Hence, in a number like 2106, the zero is used so that the positions of the 2 and 1 are correct. The second use of zero is as a number itself. Neither of these uses has an easily described history. Moreover, numbers in early historical times were much more concrete than the abstract concepts which are our numbers today. There are giant mental steps from 5 horses to 5 'things' and then to the abstract idea of "five".
- (3) One might think that once a place-value number system came into existence, then the 0 as a empty place indicator would be necessary, yet the Babylonians used this system without this feature for over 1000 years. The Babylonians' notation for numbers was quite different from ours, and they did not distinguish between 2106 and 216 (the context would have to show which was intended).
- (4) The ancient Greeks began to contribute to mathematics around the time that zero as an empty place indicator was coming into use in Babylonia, but the Greeks however, did not adopt a positional number system. Why did they not use the advantages of the Babylonian place-value system? Basically, the Greek mathematical achievements were based on geometry and therefore, they did not need to name their numbers since they worked with numbers as lengths of lines. Although Euclid's *Elements* contains a book on number theory, it is based on geometry. However, the Greek astronomers used O indicating the notation of zero. Ptolemy in the *Almagest*, written around 130 AD, uses the Babylonian sexagesimal system together with the empty place-holder O.
- (5) The scene now moves to India where it can be said that numerals were born which evolved into the highly sophisticated system in use today. In fact, by around 500 AD, Aryabhata devised a number system which had no zero, yet it was a positional system using the word "kha" which would later be called zero. There is also evidence that a dot had been used in earlier Indian manuscripts to denote an empty space and, interestingly, also to indicate an unknown, as we might use x. The first record of the Indian use of zero on a stone tablet is dated 876. Then three important Indian mathematicians tried to answer the problems arising when one tries to consider zero and negatives as numbers. Brahmagupta (7th century) attempted to give rules for arithmetic involving zero. Mahavira (830 AD) tried to improve on Brahmagupta, while Bhaskara (1300 AD) correctly stated other properties of zero, such as $0^2 = 0$, and $\sqrt{0} = 0$. These brilliant concepts were transmitted to the Islamic and Arabic mathematicians further west. In fact, al-Khwarizmi described the Indian place-value system of numerals based on 0 to 9 and Ibn Ezra, in the 12th century, wrote three treatises describing the decimal system for integers. The Indian ideas spread east to China as well. In 1247 the Chinese mathematician Ch'in Chiu-Shao wrote *Mathematical treatise in nine sections* which used the symbol O for zero.

- (6) An important link between the Hindu-Arabic number system and the European mathematics is the Italian mathematician Fibonacci who described the nine Indian symbols together with 0 in around 1200, but they were not widely used for a long time after that. It was not until the 1600s that zero came into widespread use but only after encountering a lot of resistance.

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EXERCISE 1.

Reading for detail

With reference to the text, decide whether the following statements are true or false; if TRUE, put a cross on "T" and give a full numerical line reference; if FALSE, put a cross on "F" and rewrite the statement given in the exercise to make it true.

- a) Indian mathematicians tried to find solutions regarding the use of zero and negatives as numbers.
 "T" Line reference _____
 "F" Corrected sentence _____
- b) For many years, the Babylonians did not use zero as an empty place indicator.
 "T" Line reference _____
 "F" Corrected sentence _____
- c) The two uses of zero are as a empty-place indicator and as a numerical value
 "T" Line reference _____
 "F" Corrected sentence _____
- d) Early Indian manuscripts introduced the concept of an unknown number.
 "T" Line reference _____
 "F" Corrected sentence _____
- e) The Italian mathematician Fibonacci served as a link between the Babylonian number system and European mathematics.
 "T" Line Reference _____
 "F" Corrected sentence _____
- f) The Greek mathematicians used the zero place-value system.
 "T" Line reference _____
 "F" Corrected sentence _____

EXERCISE 2.

Comprehension

Match the various peoples in Column A with their contributions to Mathematics in Column B.

COLUMN A	COLUMN B
1) Babylonians	a) decimal system for integers
2) Greeks	b) number theory based on Geometry
3) Indians	c) used O for zero
4) Chinese	d) place-value system
5) Italians	e) zero and negatives as numbers
6) Arabs	f) described Indian system

EXERCISE 3.

Contextual reference

Look back at the text and find out what these words refer to.

- a) this feature (line 12/13) _____
 b) this system (line 12) _____
 c) neither (line 7) _____
 d) they (line 43) _____
 e) it (line 22) _____

EXERCISE 4.

Focus

Match the words in Column A with their grammatical functions in Column B.

COLUMN A	COLUMN B
1) described (line 8)	a) present participle as adjective
2) used (line 6)	b) past participle as adjective
3) coming (line 17)	c) past participle in past perfect tense
4) concrete (line 8)	d) past participle in passive form
5) worked (line 20)	e) past participle in elliptical relative phrase
6) using (line 27)	f) present participle in progressive form
7) indicating (line 22)	g) gerund
8) written (line 23)	h) present participle in elliptical relative phrase
9) encountering (line 44)	i) simple past tense
	j) comparative form of adjective
	k) superlative form of adjective

EXERCISE 5.

Linking words

With reference to the text on "The History of Zero", give the function and translation in context of the following words:

TRANSLATION	FUNCTION
a) hence (line 6)	1) giving example
b) moreover (line 8)	2) time sequence
c) since (line 20)	3) listing
d) although (line 21)	4) cause and effect
e) yet (line 12)	5) contrasting
	6) giving definition
	7) adding information
	8) comparing

EXERCISE 6.

Word forms

Choose the appropriate form of the words to complete the sentences. (You may need to add an "s" to the 3rd person singular of the verb or to form a plural noun.)

1) **production, producer, produce, productive, productivity, product**

- a) More efficient methods of _____ are required to lower costs.
- b) The Soviet Union is the world's leading _____ of crude oil
- c) The use of animals in testing drugs and cosmetic _____ is prohibited.
- d) The drug _____ terrible effects on children.
- e) The Union rules on safety might also slow down _____.

2) **development, develop, developing, developer, developed**

- a) Most cities in the _____ world have difficulties regulating traffic.
- b) The land would have a high commercial value if it were sold to _____.
- c) The _____ countries are the poorer, less industrialized nations.
- d) A stable family is essential to the psychological _____ of a child.
- e) We had high hopes of _____ tourism on a big scale.
- f) The scheme includes plans to _____ an island in the Danube with housing.

3) **characterize, characteristic, characteristically, character, characterized.**

- a) What is the most important _____ of a computer?
- b) The relationship between them was _____ by tension and anxiety.
- c) Unfortunately, there was another side to his _____.
- d) He proposed a _____ brilliant solution.

EXERCISE 7.

Sentence formation

Put the following sentence into the tenses and forms requested.

The Greeks used Geometry to express their number theory

- 1) Past perfect affirmative _____
- 2) Past interrogative _____
- 3) Future progressive affirmative _____
- 4) Present perfect progressive interrogative _____
- 5) Simple past passive _____
- 6) Present conditional affirmative _____
- 7) Present perfect negative _____

EXERCISE 8.

Phrasal verb "come"

Complete the sentences with one of the following prepositions:

about, across, in for, off, out, out with, over, round, up, up against

- 1) How does it come _____ that we still need a society like the NSPCC (National Society for the Prevention of Cruelty to Children) in a civilized country?
- 2) At the time, inspectors continually came _____ children who had been ill-treated.
- 3) A computer should be programmed to warn management of problems as soon as they come _____.
- 4) Computers have come _____ a lot of criticism from people who do not really understand their purpose.
- 5) I think that she's fainted. Perhaps she'll come _____ if we throw water on her face.
- 6) We tried various methods of solving problems before installing the computer but none of them came _____.
- 7) The NSPCC come _____ new problems every day.
- 8) Fancy him throwing his dinner on the floor! I can't understand what came _____ him.
- 9) His new book has just come _____ and the film version of his last one is almost finished.
- 10) At first she was too upset to tell us what had happened but then she came _____ it all at once.

STUDENT NOTES

SECTION 2D – DICTATION

1) $\frac{V}{I} = R$ V over I equals R (all capital letters)

2) $P_1 V_1 = P_2 V_2$ P subscript one times V subscript one equals P subscript two times V subscript 2 (all in capitals)

3) $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ one over u plus one over v equals one over f (all small letters)

4) $F = \frac{mv^2}{r}$ capital F equals small m small v squared all over small r

5) $\frac{1}{R} = \frac{M}{EI}$ one over R equals M over EI (all capital letters)

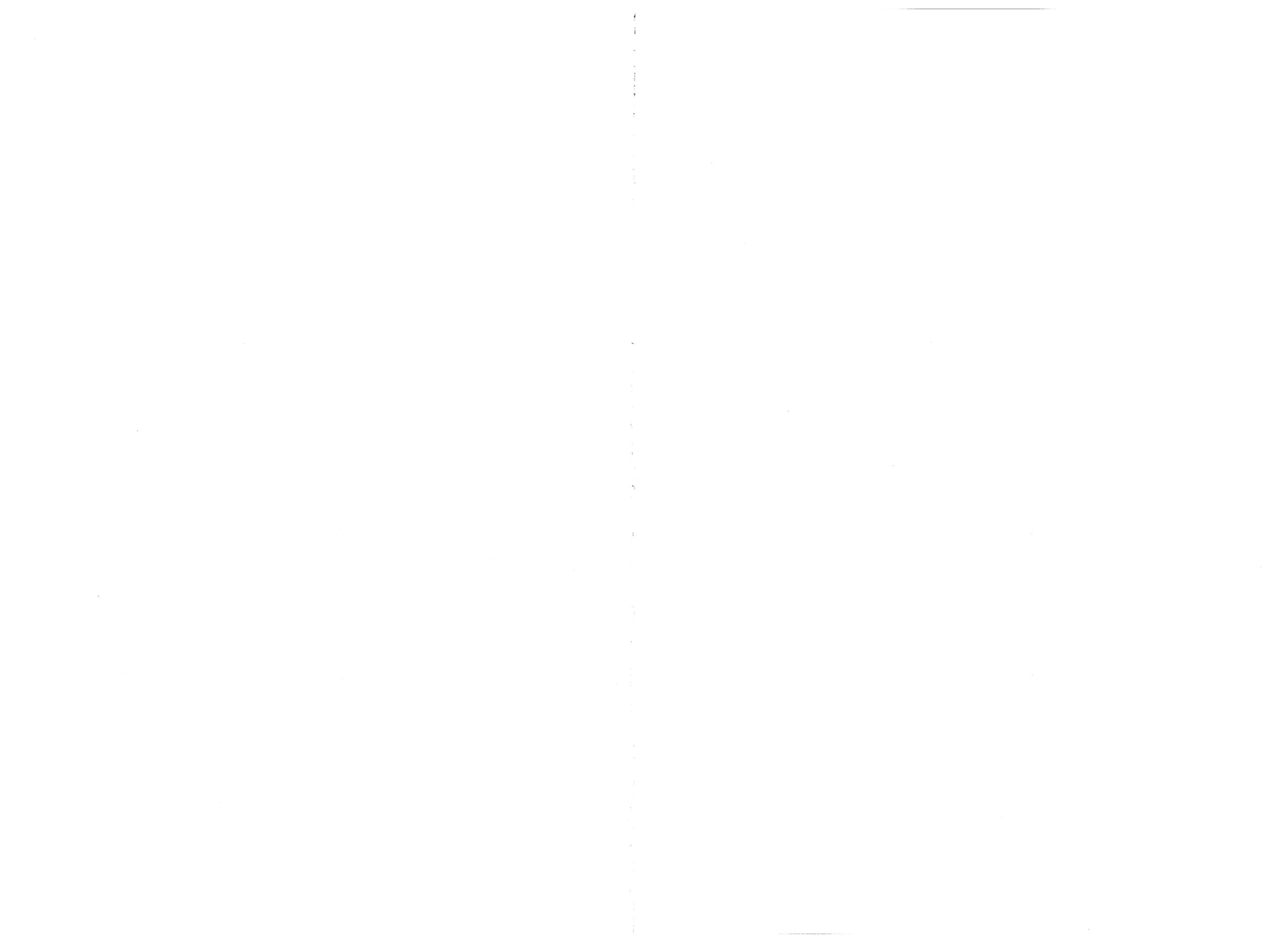
6) $\frac{\sigma}{Yn} = \frac{M}{AhR_f}$ sigma over capital Y small n equals capital M over capital A small h capital R subscript small f

7) $A = 2\pi R_c \left[R_c - \sqrt{\left(R_c^2 \frac{d^2}{4} \right)} \right]$ capital A equals two pi capital R subscript small c, open square brackets, capital R subscript small c minus the square root of, open parentheses, capital R squared subscript small c times small d squared over four close parentheses, close square brackets

8) $\tau = \frac{4Q}{3\pi R^4} (R^2 - \gamma^2)$ tau equals four capital Q over three pi capital R to the power of four, all times open parentheses capital R squared minus gamma squared, close parentheses.

9) $F \propto \frac{M_1 M_2}{R^2}$ F is proportional to M subscript one M subscript two all over R squared (all capital letters)

10) $\frac{T^2}{R^2} = \frac{4\pi^2}{GM}$ T squared over R squared equals four pi squared over GM (all capital letters)






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