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Parts of Speech

A *part of speech* is a term used in traditional grammar for one of the eight main categories into which words are classified according to their **functions** in sentences, such as nouns or verbs. Also known as *word classes*, these are the building blocks of grammar.

1/ Nouns:

A noun is a word that names a *person*, *place*, *thing*, or *idea*:

- **People** e.g. farmer, mechanic, father, Professor Haskins, editors, Marcia
- **Places** e.g. ocean, Canada, porch, Spain, classroom
- **Things** e.g. scissors, giraffe, pen, smiles, tugboat, skateboard, triangle, drill, area, cube, curve
- **Ideas** e.g. love, inspiration, courage, anxiety, eagerness, happiness

All nouns are either **common** or **proper** nouns**:**

A common noun names any person, place, or thing. Examples are: basketball, video, wizard, coin, woman, and coach.

A proper noun names a particular person, place, or thing and begins with a capital letter. Examples are: Winston Churchill, Babe Ruth, Mr. Richard Turner, and Chicago.

Here are some specific types of nouns:

A collective noun names a group of people or things. Examples of collective nouns are jury, herd, flock, family, fleet, club, class, and group.

A compound noun is a noun consisting of more than a single word. It could be separate words such as social studies, physical education, and dining room. It could be two words joined by a hyphen such as merry-go-round, thirty-three, sister-in-law, and great-grandmother. It could be a combined word such as schoolteacher, bookkeeper, landlord, and headmaster.

Activity: Underline each noun in the following sentences

1. Wendy located her housekeeper.
2. Some answers on this test are about electricity.
3. Her violin and easel were missing.
4. Their rabbit that left the yard was returned by the officer.
5. He used this umbrella in Alabama.
6. After the rain, the electrician checked the box.
7. The end of the afternoon arrived quickly.

8. This group is funny.
9. The ostrich and the orangutan are interesting.
10. My doctor and my orthodontist are neighbors.
11. In the evening, Archie likes to go boating.
12. Unfortunately, he had a rash and an allergy.
13. Her height and agility helped her win the match.
14. Linda cared for the infant throughout the night.
15. The garbage carton near the oven had licorice and noodles in it.

2/Pronouns

A pronoun is a word used in place of one or more nouns.

We use pronouns to:

- Refer to a noun (called its antecedent) that usually comes before the pronoun
- Make our writing clearer, smoother, and less awkward

In the sentence, "Roberto feels that he can win the race," ***he*** is the pronoun, and Roberto is the antecedent. In the sentence, "Terry and Jim know that they are best friends," ***they*** is the pronoun, and Terry and Jim are the noun antecedents.

There are several types of pronouns:

Personal pronouns refer to people and things. They are divided into three categories called: **first person** (referring to the person who is speaking: I went to the mall), **second person** (referring to the person spoken to: Joey, can you see the bus?), and **third person** (referring to anyone or anything else: Bob saw us do this assignment). The pronouns in the two example sentences above are personal pronouns.

The following list shows these three categories of personal pronouns:

	Singular	Plural
First person (the person speaking)	I, my, mine, me	we, our, ours, us
Second person (the person spoken to)	you, your, yours	you, your, yours
Third person (some other person or thing)	he, his, him, she, her, hers, it, its	they, their, theirs, them

In addition to *personal pronouns*, there are several other types of pronouns: *reflexive pronouns, relative pronouns, interrogative pronouns, demonstrative pronouns, and indefinite pronouns.*

A reflexive pronoun is formed by adding - ***self*** or - ***selves*** to certain personal pronouns. Examples of reflexive pronouns are: *myself, himself, herself, itself, ourselves, themselves, yourself,* and *yourselves*.

The sentence, "I found it myself," contains the personal pronoun I and the reflexive pronoun myself.

An interrogative pronoun is used to ask a question. These pronouns are *which*, *who*, *whom*, and *whose*.

A demonstrative pronoun is used to point out a specific person or thing. These pronouns include *this*, *that*, *these*, and *those*. In the sentence, "Theresa, is this yours?" *This* is the demonstrative pronoun, and yours is the personal pronoun.

An indefinite pronoun often does not refer to a specific or definite person or thing. It usually does not have a definite or specific antecedent as a personal pronoun does. In the sentence, "*Everybody* will select *another* to help with *everything*," the three italicized words are all indefinite pronouns since they take the place of a noun and do not refer to a specific or definite person or thing.

These are all indefinite pronouns:

all	each	more	one
another	either	most	other
any	everybody	much	several
anybody	everyone	neither	some
anyone	everything	nobody	somebody
anything	few	none	someone
both	many	no one	

Activity: Underline the two pronouns found in each sentence. Above each pronoun, label its type using these abbreviations: personal (PER), reflexive (REF), demonstrative (DEM), interrogative (INT), or indefinite (IND) pronoun.

1. This is the way to do it.
2. He hurt himself during gym class.
3. Can you and they finish the cleaning by three o'clock?
4. Who is the person with her?
5. I held the door for them.
6. Please tell him that we said hello.
7. Ours is older than theirs.
8. Neither of them is the clear winner of the race as of now.
9. Will she watch someone while Sarah goes shopping?
10. Those are the best ones to buy.
11. Please bring yours to us.
12. After Jerry spotted the giraffe, he photographed it.

13. Everything has gone well for us.
14. Will they be able to move the belongings by themselves?
15. All of the students know both.

Activity: Circle the pronouns in this paragraph

I could not fall asleep last night. It felt as if somebody kept knocking on the window keeping me up most of the night. This is pretty unusual. So I tried to calm myself down and think about other things besides being unable to sleep. All of my work paid off when I finally fell asleep.

3/ Adjectives

An adjective modifies (qualifies or limits the meaning of) a noun or a pronoun. It answers the questions, What kind? Which one(s)? How many? How much?

Carrie read an ***interesting*** story. (What kind of story?)

The ***recent*** article has that information. (Which article?)

Wendy paid ***fifty*** dollars for the jacket. (How many dollars?)

Much space was devoted to her artwork. (How much space?)

- An adjective can come before or after the noun or pronoun it describes:

Examples:

Older cards are found on the table. (Which cards?)

Tall players and ***intelligent*** coaches were interviewed by the ***interested*** reporter. (*Which* players? *Which* coaches? *Which* reporter?)

Tired and ***hungry***, the campers reached the lodge. (*What* kind of campers?)

The campers, ***tired*** and ***hungry***, reached the lodge. (*What* kind of campers?)

- There are several types of adjectives:

A proper adjective is formed from a proper noun.

e.g. Italian bread Herculean strength Midas touch Canadian sunset

A compound adjective is a word composed of two or more words. Sometimes these words are hyphenated.

e.g. landmark decision black-and-blue mark hometown hero

Do not use a hyphen after an adverb ending in - ly.

e.g. newly painted mural sickly sweet odor recently purchased

Formation of Adjectives

Adjectives can be formed from nouns, verbs, and other adjectives.

1) Formation of Adjectives From Nouns:

We can form adjectives from nouns by adding **suffixes** to a noun.
The Adjectives that are formed by adding **-y** or **-al** or **-ial** as a suffix are given below in the table. If the noun has an '**e**' in the ending, it is removed and **-y** or **-al** or **-ial** is added as a suffix to the noun to form an adjective.

Suffix	Noun Example	Adjective
-y	Luck	Luck**y**
	health	Health**y**
	Storm	Storm**y**
	Length	Length**y**
-al **-ial**	Accident	Accident**al**
	Nature	Natur**al**
	Magic	Magic**al**
	Commerce	Commerc**ial**
	Finance	Financ**ial**

Adjectives formed by adding –**ly or -ish** or -ic as a suffix to nouns are given below in the table. If the noun has a 'y' in the ending, it is removed and the suffix is added to form an adjective.

Suffix	Noun Example	Adjective
-ly	Man	Man**ly**
	Human	Human**ly**
	King	King**ly**
-ish	Girl	Girl**ish**
	Child	Child**ish**
	Book	Book**ish**
-ic	Tragedy	Trag**ic**
	Artist	Artist**ic**

Adjectives formed by adding **-ous** or **-some** or **-able** or **-full** as a suffix to nouns are given below in the table.

Suffix	Rule	Noun Example	Adjective
-ous	If the noun ends in '**y**', remove it	Mystery	Mysteri**ous**
	If the noun ends in '**e**', remove it	Fame	Fam**ous**
	If the noun ends with '**cle**', it is replaced by '**cul**'	Miracle	Mira**cul**ous
-some		Trouble	Trouble**some**
-able		Question	Question**able**
		Laugh	Laugh**able**
-ful	If the noun is ending with '**y**', replace it with **i**	Beauty	Beauti**ful**

2) Formation of Adjectives from Verbs

Suffixes like '**-y**' , '**-able**' , '**-ous**' , '**-al**' , '**-ful**' , '**-less**' , '**-ing**' and '**-ive**' can be added to verbs to form adjectives.

Suffix	Verb	Adjective
-y	Speed	Speed**y**
-able	Read	Read**able**
	Enjoy	Enjoy**able**
	Shake	Shake**able**
	Laugh	Laugh**able**
-ous	Continue	Continu**ous**
-al	Judge	Judgment**al**
-ful	Help	Help**ful**
	Hate	Hate**ful**
	Forget	Forget**ful**
-less	Tire	Tire**less**
-ive	Create	Creat**ive**
	Talk	Talkat**ive**
-ing	Annoy	Annoy**ing**
	Amuse	Amus**ing**

Activity:

1. Name three complimentary adjectives that describe one of your friends:
2. Name three adjectives that describe the beach on a summer's day:
3. Name three adjectives that describe a Super Bowl crowd:
4. Name three adjectives that describe a famous actor or actress:
5. Name three adjectives that describe a book or magazine article that you recently read:
6. Name three adjectives that describe a typical spring day where you live:
7. Name three adjectives that describe your favorite song:
8. Name three adjectives that describe one of your recent math tests:
9. Name three adjectives that describe one of your most difficult experiences:

4/Verbs

There are several types of verbs to be studied: the *action verb*, the *linking verb*, and the *helping verb*.

- **Action Verbs**

An action verb tells what action (often a physical action) a subject is performing, has performed, or will perform.

-My father *deliver* packages to department stores each day.

-Louie *bowled* a perfect game last night.

- Suzanne *skated* across the rink in Central Park.

-*Turn* at the next corner, Noel.

- Oscar will *help* Petra with the project.

➢ **Linking Verbs**

A linking verb connects (or links) a subject to a noun or an adjective in the predicate. The most common linking verbs are the forms of the verb "to be" (is, are, was, were, been, being, am) and appear, become, feel, grow, look, remain, seem, smell, sound, stay, taste, and turn.

-My sister *is* a doctor. (The linking verb " **is**" connects the subject "sister" with the predicate nominative, doctor.)

-My sister *is* studying to become a doctor. (In this sentence, the word "***is"*** is a helping verb for the main verb, studying." ***is*****"** does not function as a linking verb.)

-He *appeared* tired. (The linking verb, appeared, links the subject, He, with the predicate adjective, tired.)

- He *appeared* at the game. (In this sentence the verb, appeared, is an action verb, not a linking verb.)

➢ **Helping Verbs**

A helping verb assists the main verb in a sentence. There can be more than one helping verb in each sentence. In a questioning (interrogative) sentence, the helping verb is usually separated from the main verb.

The common helping verbs are: *am, is, are, was, were, be, been, being, has, had, have, do, does, did, may, might, must, can, could, shall, should, will,* and *would*.

The *italicized* word in each sentence below is the helping verb. The <u>underlined</u> word is the main verb.

The members *are going* to the city tomorrow evening.

Are the members <u>going</u> to the city tomorrow evening?

That joke *has been* <u>heard</u> around the office.

Has that joke *been* <u>heard</u> around the office?

Her brothers *are* <u>leaving</u> for the train.

Are her brothers <u>leaving</u> for the train?

5/ Adverbs

An adverb is a word that modifies (qualifies or limits) a verb, an adjective, or another adverb

◗ Many adverbs end in -*ly*.

◗ Adverbs answer any of these four questions: *Where*? *When*? *How*? To *what extent*?

◗ Adverbs make writing more specific and more exact.

◗ Here are some adverbs that do not end in -*ly*:

again	almost	alone	already	also
always	away	even	ever	here
just	later	never	not	now
nowhere	often	perhaps	quite	rather
seldom	so	sometimes	somewhat	somewhere
soon	then	there	today	too
very	yesterday	yet		

Adverbs modify verbs:

John ate ***quickly***. (*How* did he eat?)

I walk ***there***. (*Where* did I walk?)

Ashleigh will eat ***soon***. (*When* will Ashleigh eat?)

Adverbs modify adjectives:

Rex is ***very*** happy. (*Very* modifies the adjective happy and answers the question, *To what extent*?)

The program was ***too*** unrealistic. (*Too* modifies the adjective unrealistic and answers the question, *To what extent*?)

Adverbs modify other adverbs:

Warren walks ***too*** quickly. (*Too* modifies the adverb quickly and answers the question, *How quickly*?)

He moved ***rather*** recently. (*Rather* modifies the adverb recently and answers the question, *How recently*?)

Activity: In each sentence, the letters of the underlined adverb are scrambled. Unscramble the letters, and write the word on the line provided before the sentence.

1._____ He walks tsaf.

2._____ Do you want to stop ehre ?

3._____ He visits his grandmother ywlkee.

4. _____ Do you feel lewl enough to go on the trip?

5._____ Have you erve been to Mexico City?

6. _____ I wasaly run errands for her.

7. _____ Have I met you foebre ?

8. _____ I would raerht drive to your house tonight.

9. _____ Are you ilslt going to go to summer school?

10. _____ I am tno trying to insult you, Nick.

11. _____ Will you bat frsit tonight?

12._____ Are you ftneo at this location, Mitch?

13._____ Let's start the performance onw.

14. _____ May I aosl assist you, Helene?

15. _____ Thank you nlidyk.

6/ Preposition

A **common preposition** is a word that shows the relationship between a noun or a pronoun and another word in the sentence.

The man swam *under* the bridge. (*Under* connects the idea of *swam* and *bridge*.)

She walked *down* the aisle. (*Down* connects *walked* and *aisle*.)

Julie walked *around* the campus and *toward* town. (*Around* connects *walked* and *campus* .*Toward* connects *walked* and *town*.)

Here are the most commonly used prepositions:

aboard	about	above	across
after	against	along	among
around	as	at	before
behind	below	beneath	beside
besides	between	beyond	but
by	concerning	despite	down
during	except	for	from
in	inside	into	like
near	of	off	on
onto	opposite	out	outside
over	past	since	through
throughout	till	to	toward
under	underneath	until	up
upon	with	within	without

N.B a preposition can be also compound. It does the same as a common preposition but is composed of two or more words. Here are the most common **compound prepositions**:

according to	ahead of	apart from	as of
aside from	because of	by means of	in addition to
in back of	in front of	in place of	in spite of
instead of	in view of	next to	on account of
out of	prior to		

Activity: Underline the preposition in each of the following sentences.

1. The teammates walked beyond the bleachers.
2. The track team ran into the hills.
3. The temperature is several degrees below zero.

4. Call me around four o'clock.
5. It is a matter concerning bad behavior.
6. The parents joined in the conversation.
7. Ronnie fell asleep during the professor's lecture.
8. We found the sleeping cat underneath the blanket.
9. The couple walked near the bridge.
10. The children slid down the slide yesterday.
11. We lost contact over time.
12. This letter is addressed to your sister.
13. The strong man swam across the wide lake.
14. This group is under great suspicion.

7/ Conjunction

A conjunction connects words or group of words. There are **three types of conjunctions**: ***coordinating conjunctions***, ***correlative conjunctions***, and ***subordinating conjunctions***.

1/ coordinating conjunctions: is a single connecting word. These seven words are: *for*, *and*, *nor*, *but*, *or*, *yet*, and *so*.

e.g. The boys ***and*** girls worked at the fair. (***And*** joins the names *boys* and *girls*.)

Paula ***or*** Jeannine can go with you tonight. (***Or*** joins the names *Paula* and *Jeannine*.)

I would like to help you, ***but*** I will be busy tonight. (***But*** joins two sentences or complete ideas.)

We must leave early ***so*** we can get to the wedding reception on time. (***So*** joins two sentences or two complete ideas.)

Remember the made-up word FANBOYS when you memorize the coordinating conjunctions. Each letter in this word (**F**or, **A**nd, **N**or, **B**ut, **O**r, **Y**et, **S**o) stands for a coordinating conjunction.

2/ Correlative conjunctions: are pairs of connecting words. These five pairs of words are

both/and, *either/or*, *neither/nor*, *not only/but also*, and *whether/or*.

e.g.

- **Both** Henry **and** Henrietta are leaving the dance now. (The correlative conjunctions join two names.)

- ***Not only*** will they leave now, but they will also not be here to help clean up. (The correlative conjunctions join two sentences or complete ideas.)

-***Either*** go with them ***or*** stay here and help. (The correlative conjunctions illustrate a choice.)

He went ***neither*** to the stadium ***nor*** to the concert hall during this vacation. (The correlative conjunctions join two prepositional phrases.)

WRITING TIP *Using conjunctions adds sophistication to sentences. Rather than using two very simple sentences such as, "The monkey climbed the tree," and "The monkey threw down a banana," combine them by using the conjunction* and: *"The monkey climbed the tree and threw down a banana" is a more sophisticated sentence. Make good use of the conjunctions for combining ideas.*

3/ Subordinating conjunction

A subordinating conjunction is a word that connects an independent clause to a dependent clause. An independent clause can stand alone as a sentence. In other words, it does not need any additional information to operate as a sentence. The sentence "The student failed the test" is an example of an independent clause.

A dependent clause adds extra information to the main clause. These clauses cannot stand by themselves and their meaning is dependent on the independent clause. They are not complete sentences. For example, "because she didn't study" is not a complete sentence.

However, combine the two clauses, and we have "The student failed the test because she didn't study." A complete idea has been expressed and enough information has been presented to fully explain the thought. What joined the two clauses? The word "because." And there we have our first subordinating conjunction.

Using Subordinating Conjunctions

- It introduces a dependent clause and indicates the nature of the relationship among the independent clause(s) and the dependent clause(s).

Subordinating Conjunctions	Relationship
unless, provided that, if, even if	Condition
because, as, as if	Reason
rather than, than, whether	Choice
though, although, even though, but	Contrast
where, wherever	Location
in order that, so, so that, that	Result, effect
while, once, when, since, as whenever, after, before, until, as soon	Time

- ✓ You'll notice that when a dependent clause precedes an independent clause, there's a comma (,) between the two, indicating the beginning of the independent clause. However, when the independent clause comes first, there's usually no need to separate the two clauses with a comma.

The most common subordinating conjunctions are: *after, although, as, because, before, how, if, once, since, than, that, though, until, when, where, whether,* and *while.*

Examples of Subordinating Conjunctions

In the following examples, the subordinating conjunctions are in bold for easy identification:

1. ***As*** Sherri blew out the candles atop her birthday cake, she caught her hair on fire.
2. Sara begins to sneeze ***whenever*** she opens the window to get a breath of fresh air.
3. ***When*** the doorbell rang, my dog Skeeter barked loudly.

Activity: The following exercises will help you gain greater understanding about how subordinating conjunctions work. Choose the best answer to complete each sentence.

1. _____ the basement flooded, we spent all day cleaning up.
    1. After
    2. Although
    3. Before
    4. Even if

    Answer: 1. *After* the basement flooded, we spent all day cleaning up.

2. I don't want to go to the movies _____ I hate the smell of popcorn.
    1. Although
    2. Because
    3. Whenever
    4. So that

    Answer: 2. I don't want to go to the movies *because* I hate the smell of popcorn.

3. I paid Larry, _____ garden design work is top-notch.
    1. Whenever
    2. Whose
    3. After
    4. If

    Answer: 2. I paid Larry, *whose* garden design work is top-notch.

4. _____ spring arrives, we have to be prepared for more snow.
    1. Because
    2. Until
    3. Although
    4. Now that

    Answer: 2. *Until* spring arrives, we have to be prepared for more snow.

5. _____ the alarm goes off, I hit the snooze button.
    1. As soon as
    2. Because
    3. Before
    4. Now that

    Answer: *As soon as* the alarm goes off, I hit the snooze button.

Activity: Circle the conjunction or pair of conjunctions in each sentence:

1. Lyle chose both steak and salad for his dinner.
2. I chose neither steak nor salad for my dinner.
3. Either you or he can drive Dad to the train station tomorrow morning.
4. The panda wanted to eat, for he was hungry.
5. Peanut butter and jelly is Rex's favorite sandwich.
6. Not only the girls but also the boys will be invited to the assembly.
7. Sara did not know whether to swing at the ball or take the pitch.
8. Mark would like to go, but he cannot.
9. Rich likes the food at this restaurant, yet he seldom eats here.
10. Run with him or her.

Activity: Use these coordinating and correlative conjunctions in your own sentences:

11. Use *neither . . . nor*:

……
……

12. Use *but*:

……
……

13. Use *for*:

……
……

14. Use or:

……
……

15. Use *either . . . or*:

……
……

8/ Interjection

An interjection is a word that expresses strong feeling or emotion:

◗ An interjection usually comes at the beginning of the sentence.

◗ An interjection is often followed by an exclamation point (!) when the emotion is strong or a comma (,) when the emotion is mild.

◗ Do not overuse interjections. Include one when you want to make your point. If you use too many interjections, your writing loses its power and effectiveness.

◗ Here are some common interjections:

Aw	Bravo	Darn	Dear me
Eek	Eh	Gee	Golly
Goodness gracious	Gosh	Hallelujah	Hey
Horrors	Hurrah	Hurray	Mmm
Oh	Oh no	Oops	Ouch
Phew	Rats	Really	Ugh
Well	Whoa	Whoops	Wow
Yea	Yeh	Yes	Yippee

Activity: Every word in Group One begins with the letter ***o***. Match each with its description found in Group Two

Group One

A. our
B. outside
C. Ohio
D. or
E. one
F. ours
G. Oh
H. oafish
I. own
J. off
K. ordered
L. only
M. owl
N. oneself
O. owners
P. originally

Group Two

1. possessive pronoun
2. present tense verb
3. plural noun
4. conjunction
5. singular noun
6. adverb and preposition
7. adjective
8. past tense verb
9. proper noun
10. adverb only
11. adverb, adjective, noun, and preposition
12. adjective, pronoun, and noun
13. adjective, conjunction, and adverb
14. interjection
15. pronoun and adjective
16. reflexive pronoun

Spoken Mathematics

Basic arithmetic operations

Addition:	$3+5=8$	three plus five equals [= is equal to] eight
Subtraction:	$3-5=-2$	three minus five equals [= ...] minus two
Multiplication:	$3\cdot 5=15$	three times five equals [= ...] fifteen
Division:	$3/5=0.6$	three divided by five equals [= ...] zero point six

$(2-3)\cdot 6+1=-5$	two minus three in brackets times six plus one equals minus five
$\frac{1-3}{2+4} = -1/3$	one minus three over two plus four equals minus one third
$4!$ $[= 1\cdot 2\cdot 3\cdot 4]$	four factorial

Arithmetic

Integers

0	zero	10	ten	20	twenty
1	one	11	eleven	30	thirty
2	two	12	twelve	40	forty
3	three	13	thirteen	50	fifty
4	four	14	fourteen	60	sixty
5	five	15	fifteen	70	seventy
6	six	16	sixteen	80	eighty
7	seven	17	seventeen	90	ninety
8	eight	18	eighteen	100	one hundred
9	nine	19	nineteen	1000	one thousand

Fractions [= Rational Numbers]

$\frac{1}{2}$	one half
$\frac{1}{3}$	one third
$\frac{1}{4}$	one quarter [= one fourth]
$\frac{1}{5}$	one fifth
$-\frac{1}{17}$	minus one seventeenth
$\frac{3}{8}$	three eighths
$\frac{26}{9}$	twenty-six ninths
$-\frac{5}{34}$	minus five thirty-fourths
$2\frac{3}{7}$	two and three sevenths

Real Numbers

-0.067	minus nought point zero six seven
81.59	eighty-one point five nine
$-2.3 \cdot 10^6$	minus two point three times ten to the six
$[= -2\ 300\ 000$	minus two million three hundred thousand]
$4 \cdot 10^{-3}$	four times ten to the minus three
$[= 0.004 = 4/1000$	four thousandths]
$\pi\ [= 3.14159\ldots]$	pi [pronounced as 'pie']
$e\ [= 2.71828\ldots]$	e [base of the natural logarithm]

Exponentiation, Roots

5^2	$[= 5 \cdot 5 = 25]$	five squared
5^3	$[= 5 \cdot 5 \cdot 5 = 125]$	five cubed
5^4	$[= 5 \cdot 5 \cdot 5 \cdot 5 = 625]$	five to the (power of) four
5^{-1}	$[= 1/5 = 0.2]$	five to the minus one
5^{-2}	$[= 1/5^2 = 0.04]$	five to the minus two
$\sqrt{3}$	$[= 1.73205\ldots]$	the square root of three
$\sqrt[3]{64}$	$[= 4]$	the cube root of sixty four
$\sqrt[5]{32}$	$[= 2]$	the fifth root of thirty two

In the complex domain the notation $\sqrt[n]{a}$ is ambiguous, since any non-zero complex number has n different n-th roots. For example, $\sqrt[4]{-4}$ has four possible values: $\pm 1 \pm i$ (with all possible combinations of signs).

$(1+2)^{2+2}$	one plus two, all to the power of two plus two
$e^{\pi i} = -1$	e to the (power of) pi i equals minus one

SECTION III — BASIC SYMBOLS

Symbol	Speak	Notes
$+$	plus or positive	
$-$	minus or negative	
x or $\cdot$	multiplies or times	
$\div$ or $/$	divided by	
$\lvert\ \rvert$	absolute value	
$\lvert$	divides	
$\pm$	plus or minus	
$\mp$	minus or plus	
$=$	equals or equal to	
$\neq$	does not equal or not equal to	
$\equiv$	identical to	
$\not\equiv$	not identical to	
$\approx$ or $\backsimeq$	approximately equal to	
$\sim$	equivalent to	
$\lesssim$	approximately equal but less than	
$\leq$	less than or equal to	

Symbol	Speak	Notes
$<$	less than	
$\ll$	much less than	
$\not<$	not less than	
$\gtrsim$	approximately equal but greater than	
$\geq$	greater than or equal to	
$>$	greater than	
$\gg$	much greater than	
$\not>$	not greater than	
(	open parenthesis or left parenthesis	
)	closed parenthesis or right parenthesis	
[	open bracket or left bracket	
]	closed bracket or right bracket	
{	open brace or left brace	
}	closed brace or right brace	

Symbol	Speak	Notes
$\lvert a \rvert$	absolute value of a	In this case a is any real number.
a'	a prime	If a is an angle, a' is read as a minutes.
a''	a double prime	If a is an angle, a'' is read as a seconds.
$a^{[n]}$	a with n primes	
a^n	a superscript n or a to the n	
$\overline{a}$	a bar	
a^*	a star or a super asterisk	
a_n	a subscript n or a sub n	When $n = 0$, a_n may be read as a naught.
$\sqrt{}$	radical sign	
$\sqrt{a}$	square root of a	
$\sqrt[3]{a}$	cube root of a	
$\sqrt[n]{a}$	nth root of a	
ϕ	zero or null set	to distinguish from the letter o

Symbol		Speak	Notes
$\not{z}$		the letter z	to distinguish from 2
$\aleph$		aḥ lef	aleph, the first letter of the Hebrew alphabet
$\prod$		product	Example: $\prod_{i=1}^{n}$ is read product from i=1 to n.
$\sum$		summation	Example: $\sum_{i=1}^{n}$ is read summation from i=1 to n.
$\int$		integral	Example: $\int_{a}^{b}$ is read integral from a to b.
d/dx	or or	d over d x d by d x the derivative with respect to x	
$\partial/\partial x$	or	the partial derivative with respect to x partial over partial x	
∇		del	
!		factorial	Example: n! is read n factorial.
*	or	star asterisk	

SECTION IV — ALGEBRA

The small letters of the alphabet, a, b, c, d, ..., may be any numbers.

Expression	Speak	Notes
$a + b$	a plus b	
$a + b + c$	a plus b plus c	
$a - b$	a minus b	
$-a - b$	minus a minus b	
$a + b - c$	a plus b minus c	
$a - b - c$	a minus b minus c	
$a - (b + c)$	a minus the sum b plus c or a minus the quantity b plus c or a minus open parenthesis b plus c close parenthesis	
$a - (b - c)$	a minus the difference b minus c or a minus the quantity b minus c or a minus open parenthesis b minus c close parenthesis	

Expression	Speak	Notes
$a \times b$	a times b or a cross b or the product of a and b or a multiplied by b	
$a \cdot b$	a times b or a dot b or the product of a and b or a multiplied by b	
ab	a b or a times b or the product of a and b or a multiplied by b	
$a \cdot -b$	a times minus b	
$ab + c$	a b plus c	
$a\,(b + c)$	a times the sum b plus c or a times the quantity b plus c or a times open parenthesis b plus c close parenthesis	
$a\,(b + c) + d$	a times the quantity b plus c end of quantity plus d or a open parenthesis b plus c close parenthesis plus d	
$ab - c$	a b minus c	
$a\,(b - c)$	a times the difference b minus c or a times the quantity b minus c or a open parenthesis b minus c close parenthesis	
$a\,(-b - c)$	a times the quantity minus b minus c or a open parenthesis minus b minus c close parenthesis	

$a\ (b - c + d)$	or	a times the quantity b minus c plus d a open parenthesis b minus c plus d close parenthesis
$ab + cd$		a b plus c d
$ad - bc$		a d minus b c
$a\ (b + c) - e\ (f - g)$	or	a times the quantity b plus c end of quantity minus e times the quantity f minus g a open parenthesis b plus c close parenthesis minus e open parenthesis f minus g close parenthesis
$a[b + c - e(f - g)]$	or	a times the quantity b plus c minus the product e times the difference f minus g end of quantity a open bracket b plus c minus e open parenthesis f minus g close parenthesis, close bracket
$(a + b)\ (c + d)$	or or	the sum a plus b times the sum c plus d the product of the sum a plus b and the sum c plus d open parenthesis a plus b close parenthesis open parenthesis c plus d close parenthesis
$\frac{1}{2}$	or	one half one over two
$\frac{1}{3}$	or	one third one over three
$\frac{1}{n}$		one over n

$\frac{a}{d}$ a/d $a \div d$	or or	a over d a divided by d the ratio of a to d
$\frac{a+b}{d}$	or	the fraction, the numerator is a plus b, the denominator is d the quantity a plus b divided by d
$a + \frac{b}{d}$		a plus the fraction b over d
$a + \frac{b}{c+d}$	or	a plus the fraction, the numerator is b and the denominator is c plus d a plus the fraction b divided by the quantity c plus d
$\frac{a+b}{c} + d$		the quantity a plus b over c, that fraction plus d
$a + \frac{b}{c} + d$		a plus the fraction b over c, that fraction plus d

STATISTICS AND MATHEMATICS OF FINANCE

Symbol		Speak	Notes
χ^2		chi-square	
d.f.		degrees of freedom	
F		capital f	F ratio
i		i	width of a class interval
k		k	coefficient of alienation
P.E.	or	probable error probable deviation	

r	or	r correlation coefficient	Pearson product moment, correlation coefficient between two variables
$r_{12 \cdot 34...n}$		r sub the quantity one two dot three four dot dot dot n	partial correlation coefficient between variables one and two in a set of n variables
s sd		standard deviation	from a sample
σ_x		sigma sub x	standard deviation of the population of x
σ_{xy}		sigma sub x y	standard error of estimate, standard deviation of an x array for a given value of y
t	or or	t students' t statistic students' t test	
V		capital v	coefficient of variation
$\overline{x}$		x bar	arithmetic average of the variable x from a sample
μ		mu	arithmetic mean of a population
μ_2		mu sub two	second moment about the mean
μ_r		mu sub r	r^{th} moment about the mean
β_1		beta sub one	coefficient of skewness
β_2		beta sub two	coefficient of kurtosis
$\beta_{12 \cdot 34}$		beta sub the quantity one two dot three four	multiple regression coefficient in terms of standard deviation units
η		eta	correlation ratio
z		z	Fisher's z statistic

Q_1	capital q sub one	first quartile
Q_3	capital q sub three	third quartile
E(x)	capital e of x	expected value of x, expectation of x
$P(x_i)$	capital p of x sub i	probability that x assumes the value x sub i
%	percent	
$	dollar or dollars	
¢	cent or cents	
@	at	Example: three oranges @ $1.00 each is read three oranges at one dollar each.
$j_{(p)}$	j sub p in parentheses	nominal rate (p conversion periods per year)
n	n	number of periods or years
l_x	l sub x	number of persons living at age x (mortality table)
d_x	d sub x	number of deaths per year of persons of age x (mortality table)
p_x	p sub x	probability of a person of age x living one year
q_x	q sub x	probability of a person of age x dying within one year
${}_nA_x$	left-subscript n capital a sub x	net single premium for $1 of term insurance for n years for a person aged x
${}_nP_x$	left-subscript n capital p sub x	premiums for a limited payment life policy of $1 with a term of n years at age x
$s_{\overline{n}\rceil}$	s sub n right angle	compound amount of $1 per annum for n years at a given interest rate

Translation

Linear equation معادلة خطية

Cubic equation معادلة تكعيبية

Quadratic equation معادلة تربيعية

Regressing equation معادلة التراجع

Differential equation معادلة تفاضلية

First-order equation معادلة من الدرجة الثانية

Root of an equation جذر المعادلة

Fraction كسر

Function دالة

abridged multiplication اَلضرْب اُلمخْتصر

absolute coefficient ُمعامِل ُمْطَلق

abstract mathematics رِياضّيات ُمَجرَّدة

abstract property خاصية ُمَجرَّدَة

additive algorithm خوارزْمية َجْمَعية

analytic function دآلة َتحِليلية

bilinear function دآلة ُثنائِية اَلخطَّية

frequency function دالة ِتكرار

Homogenous differntial equation معادلـــــة َتفأُضـــــلية ُمتجانسة

polynomial equation ُمعادلة َكثيرة اُلحدود

polynomial function دالة َكثيرة ُحدود

rate ُمعدل

rate of change ُمَعدل التغيير

rate of convergence ُمَعدل التقارُب

ratio ِنسبة

Selected Texts

Texte 1

Task: Read the text, understand it and then translate the paragraph number 5§ into Arabic

Mathematics can be subdivided into the study of structure, quantity, space, and change. There are also subdivisions dedicated to exploring links from mathematics to other fields: to logic, to set theory (foundations),

to the empirical mathematics of the various sciences (applied mathematics), and more recently to the rigorous study of uncertainty.

The study of quantity begins with numbers, first the familiar natural numbers and integers ("whole numbers") and arithmetical operations on them, which are characterized in arithmetic. The deeper properties of integers are studied in number theory, from which come such popular results as Fermat's Last Theorem.

As the number system is further developed, the integers are recognized as a subset of the rational numbers ("fractions"). These, in turn, are contained within the real numbers, which are used to represent continuous quantities. Real numbers are generalized to complex numbers.

Discussion of the natural numbers leads to the transfinite numbers, which formalize the concept of "infinity". Another area of study is size, which leads to the cardinal numbers and then to another conception of infinity: the aleph numbers, which allow meaningful comparison of the size of infinitely large sets.

Many mathematical objects, such as sets of numbers and functions, exhibit internal structure. The structural properties of these objects are investigated in the study of groups, rings, fields and other abstract systems, which are themselves such objects. This is the field of abstract algebra. An important concept here is that of vectors, generalized to vector spaces, and studied in linear algebra. The study of vectors combines three of the fundamental areas of mathematics: quantity, structure, and space. A number of ancient problems concerning Compass and straightedge constructions were finally solved using Galois theory.

The study of space originates with geometry – in particular, Euclidean geometry. Trigonometry is the branch of mathematics that deals with relationships between the sides and the angles of triangles and with the trigonometric functions; it combines space and numbers, and encompasses the well-known Pythagorean theorem. The modern study of space summarizes these ideas to include higher- dimensional geometry, non-Euclidean geometries and topology. Quantity and space both play a role in analytic geometry, differential geometry, and algebraic geometry. Within differential geometry are the concepts of fiber bundles and calculus on manifolds, in particular, vector and tensor calculus. Within algebraic geometry is the description of geometric objects as solution sets of polynomial equations, combining the concepts of quantity and space, and also the study of topological groups, which combine structure and space. Lie groups are used to study space, structure, and change. Topology in all its many ramifications may have been the greatest growth area in 20th century mathematics; it includes point-set topology, set-theoretic topology, algebraic topology and differential topology. In particular, instances of modern day topology are metrizability theory, axiomatic set theory, homotopy theory, and Morse theory. Topology also includes the now solved Poincaré conjecture and the controversial four color theorem, whose only proof, by computer, has never been verified by a human.

To understand and describe change is a common theme in the natural sciences, and calculus was developed as a powerful tool to investigate it. Functions arise here, as a central concept describing a changing quantity. The rigorous study of real numbers and functions of a real variable is known as real analysis, with complex analysis the equivalent field for the complex numbers.

Functional analysis focuses attention on (typically infinite-dimensional) spaces of functions. One of many applications of functional analysis is quantum mechanics. Many problems lead naturally to relationships between a quantity and its rate of change, and these are studied as differential equations. Many phenomena in nature can be described by dynamical systems; chaos theory makes precise the ways in which many of these systems exhibit unpredictable yet still deterministic behavior.

Text 2

Mathematical problems (an extract from the lecture of D. Hilbert, Paris 1900)

“Every solution breeds new problems”. --Murphy's law—

Read the text then do the activities

History teaches the continuity of the development of science. We know that every age has its own problems, which the following age either solves or casts aside as profitless and replaces by new ones. If we would obtain an idea of the probable development of mathematical knowledge in the immediate future, we must let the unsettled questions pass before our minds and look over the problems which the science of today sets and whose solution we expect from the future. To such a review of problems the present day, lying at the meeting of the centuries seems to be well adapted. For the close of a great epoch not only invites us to look back into the past but also directs our thoughts to the unknown future.

The deep significance of certain problems for the advance of mathematical science in general and the important role which they play in the work of the individual investigator are not to be denied. As long as a branch of science offers an abundance of problems, so long is it alive; a lack of problems foreshadows extinction or the cessation of independent development. Just as every human undertaking pursues certain objects, so also mathematical research requires its problems. It is by the solution of problems that the investigator tests the temper of his steel; he finds new methods and new outlooks, and gains a wider and freer horizon.

It is difficult and often impossible to judge the value of a problem correctly in advance; for the final award depends upon the gain which science obtains from the problem. Are whether there general criteria which mark a good mathematical problem? An old French mathematician said: "A mathematical theory is not to be considered complete until you have made it so clear that you can explain it to the first man whom you meet on the street." This clearness and ease of comprehension, here insisted on for a mathematical theory, I should still more demand for a mathematical problem if it is to be perfect; for what is clear and easily comprehended attracts, the complicated repels us.

Moreover a mathematical problem should be difficult in order to entice us, yet not completely inaccessible, lest it mock at our efforts. It should be to us a guide post on the mazy paths to hidden truths, and ultimately a reminder of our pleasure in the successful solution.

The mathematicians of past centuries were accustomed to devote themselves to the solution of difficult particular problems with passionate zeal. They knew the value of difficult problems. For example, the "problem of the line of quickest descent," proposed by John Bernoulli. Experience teaches, explains Bernoulli, that lofty minds are led to strive for the advance of science by nothing more than by laying before them difficult and at the same time useful problems, and he therefore hopes to earn the thanks of the mathematical world by following the example of men like Mersenne, Pascal, Fermat, Viviani and others and laying before the distinguished analysts of his time a problem by which, as a touchstone, they may test the value of their methods and measure their strength. The calculus of variations owes its origin to this problem of Bernoulli and to similar problems.

1/ Put the statements in the right order.

1. Mathematics helps to find solutions to various problems.

2. The solution of the problem depends on the perspective of privilege that will get the science.

3. There are different problems in each time of our life.

4. Mathematical problem should be difficult in order to entice us.

5. Lack of problems foreshadows extinction or the cessation of independent development.

2/Match the words opposite in meaning.

1.difficult	**a. mess**
2. clearness	**b. starting**
3. problem	**c. independent**
4. lack	**d. well-known**
5. dependent	**e. easy**
6. final	**f. prevent**
7. order	**g. secondary**
8. help	**h. plenty**
9. general	**i. misunderstanding**
10. unknown	**j. solution**

NB: This document is exclusively given as a support for students; more details and explanations will be carried out in the classroom throughout several sessions in presence.

Best wishes