Chapter 15

Syllogism

INTRODUCTION

Syllogism is a Greek word that does mean 'inference' or 'deduction'. The problems of syllogism are based on two parts :

1. Proposition / Propositions
2. Conclusion / Conclusions drawn from given proposition/ propositions

PROPOSITION

Just consider the sentences given below:

(i) "All lions are pigs"

Subject — Predicate

(ii) "No cat is rat"

Subject — Predicate

(iii) "Some girls are beautiful"

Subject — Predicate

(iv) "Some kites are not birds"

Subject — Predicate

All the sentences mentioned above give a relation between subject and predicate. Here, it is clear from the sentences that a subject is the part of a sentence something is said about, while a predicate is the term in a sentence which is related to the subject.

Now, let us define the proposition :

A proposition is a sentence that makes a statement giving a relation between two terms. It has three parts :

(a) The subject
(b) The predicate
(c) The relation between subject and predicate

CATEGORICAL PROPOSITION

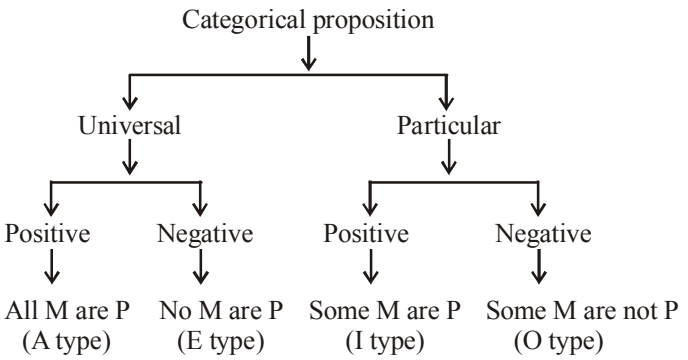
Let us see the sentences given below :

"All M are P"
"No M are P"
"Some M are P"
"Some M are not P"

What we notice in all above-Mentioned sentences that they are **condition free**. These type of sentences are called **Categorical Propositions**. In other words a categorical proposition has no condition attached with it and it makes direct assertion. It is different from non-categorical proposition which is in the format

"If M then P"

TYPES OF CATEGORICAL PROPOSITION:



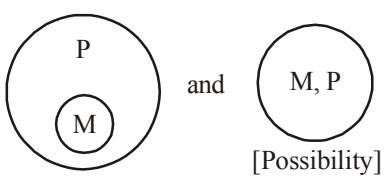
Therefore, it is clear, that universal propositions either completely include the subject (A type) or completely exclude it (E type). On the other hand, particular propositions either only partly include the subject (I type) or only partly exclude the subject (O type).

Now, we can summarise the four types of propositions to be used while solving the problems of syllogism :

Format	Type
All M are P	A
No M are P	E
Some M are P	I
Some M are not P	O

❑ Shortcut Approach

All M are P (A type):



[Possibility]

No M are P (E type):

Some M are P (I type):

Either:

Some M are P

[Some M are not P]

Or :

Some M are P

[All P are M]

Some M are not P (O type):

Either:

Some M are not P

[Some M are P]

Or:

Some M are not P
[All P are M]

HIDDEN PROPOSITIONS

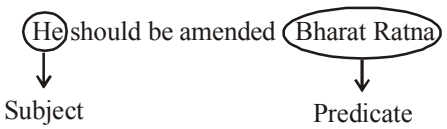
(A) A type:

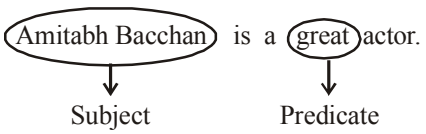
Apart from 'all' it starts with every, each and any.

EXAMPLE

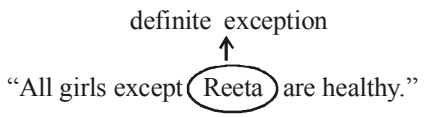
Every girl is beautiful.
[All girls are beautiful.]

(i) A positive sentence with a particular person as its subject is A type.





(ii) A sentence in with a definite exception is A type :



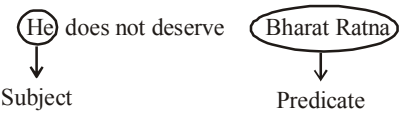
(B) E type:

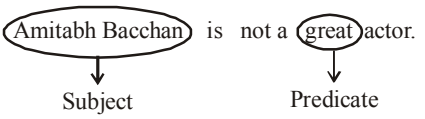
Apart from 'no' this type of propositions starts from 'no one', 'none', 'not a single' etc.

EXAMPLE

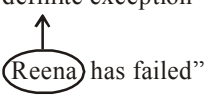
No one (student) is studious.
[No student is studious]

(i) A negative sentence with a particular person as its subject is E type propoistion.





(ii) Sentences in following formats are E type :
"No student except



"Is there any truth left in the world"
[No truth is left in the world.]

(C) I type:

Apart from some it also starts with words such as often, frequently, almost, generally, mostly, a few, most etc.

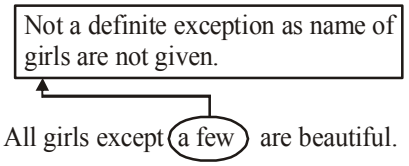
EXAMPLE

(i) Almost all the girls are beautiful.
[Some girls are beautiful].

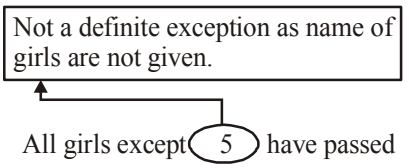
(ii) Most of the garments are handmade.
[Some of the garments are handmade].

It is clear from the above examples that negative sentences begining with words like 'few', 'rarely', 'seldom', etc. (Also 'hardly', 'scarcely', 'little' etc.) are to be reduced to I type.

Just see the other formates given below



[Some girls are beautiful]



[Some girls have passed]

Therefore, a positive proposition with an indefinite exception is reduced to I type.

(D) O type :

Apart from "Some ..... not' this type of statements start with words like 'all', 'every', 'any', 'each', etc.

EXAMPLE

(i) All girls are not beautiful.
[Some girls are not beautiful]

(ii) Poor are usually not healthy.
[Some poor are not healthy]

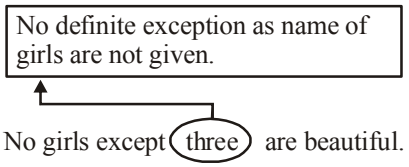
Now, it is clear from the above mentioned examples that negative propositions with words such as 'almost', 'frequently', 'most', 'mostly', 'a few', generally, etc. are to be reduced to the O–type propositions.

Again, positive propositions starting with words like 'few', 'scarcely', 'rarely', 'little', 'seldom' etc. are said to be O–type.

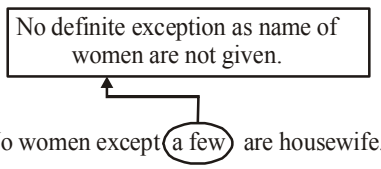
EXAMPLE

Seldom are women jealous.
[Some women are not jealous]

Also, see the following formates :



[Some girls are not beautiful.]



Therefore, a negative proposition with an indefinite exception, is reduced to O type.

EXCLUSIVE PROPOSITIONS

Such propositions start with 'only', 'alone', 'none else but', 'none but' etc. and they can be reduced to either A or E or I format.

EXAMPLE

Only graduates are Probationary Officers.

⇒ No graduate is Probationary Officer (E type)

⇒ All Probationary Officers are graduates. (A type)

⇒ Some graduates are Probationary Officers (I type)

General format of sentences given in the examinations :

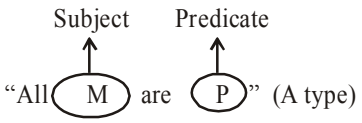
All M are P	(A type)
No M are P	(E type)
Some M are P	(I type)
Some M are not P	(O type)

Note **:** General format given above are frequently asked formats in the examinations. But students must be ready for other hidden formates of A, E, I and O types of propositions as problems in hidden formates can also be given in question papers.

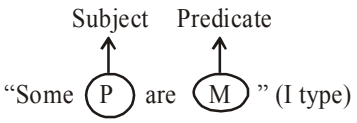
CONVERSION OF PROPOSITIONS

Before solving the problems of syllogism it is must to know the conversion rules of all A, E, O, and I types of propositions :

(i) Conversion of A type :

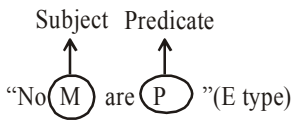


After conversion it becomes.

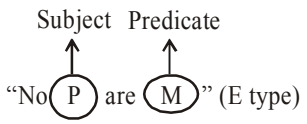


Therefore, it is clear that A type of propositions get converted into I type.

(ii) Conversion of E type :

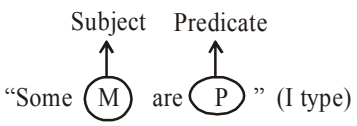


After conversion it becomes

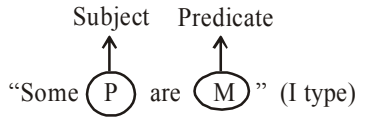


Therefore, E gets converted into E.

(iii) Conversion of I type :



After conversion it becomes



Therefore, I gets converted into I.

(iv) Conversion of O type :

O type of proposition can't be converted.

Note : In each conversion, subject becomes predicate and predicate becomes subject.
In fact, conversion is an immediate inference that is drawn from a single proposition while inference drawn from two propositions are called mediate inference.

❑ *Shortcut Approach*

Table of conversion :

Type of proposition	Get converted into
A	I
E	E
I	I
O	Never get converted

Rule to draw conclusion :

After knowing conversion of propositions, we must learn the rules to draw conclusions. In problems of syllogism, conclusions are drawn either from single propositions or from two proposition or from both. But a conclusion from single proposition is just a conversion of that proposition while to get conclusion from two propositions a certain table is used that tells us what type of conclusion (in form of proposition) we get out of two propositions. To understand it, let us see the following conclusion table :

Conclusion Table		
I Proposition	**II Proposition**	**Conclusion**
A	A	A
A	E	E
E	A	$(O)^R$
E	I	$(O)^R$
I	A	I
I	E	O

Note :

(a) Apart from above 6 pairs of propositions, no other pair will give any conclusion.

(b) The conclusion drawn out of two propositions is itself a proposition and its subject is the subject of the Ist statement while its predicate is the predicate of the 2nd statement. The common term get disappeared.

(c) $(O)^R$ does mean that the conclusion is O type but is in reverse order. In this case, the subject of the inference or conclusion is the predicate of the 2nd proposition and the predicate of the conclusion is the subject of the Ist sentence or statement.

(d) The conclusion table gives correct conclusions or inference if and only if the two propositions are aligned properly.

WHAT IS ALIGNING ?

Let us see the following examples :

EXAMPLE

Statements :

I. All (girls) are beautiful.

II. Some (girls) are Indian.

EXAMPLE

Statements :

I. No (pen) is chair.

II. Some tables are (pen).

EXAMPLE

Statements :

I. Some women are (men).

II. No (men) is chair.

In all the above mentioned example, we notice that in two statements of every example, there is a common term. In example 1 the word 'girl' is common; in example 2 the word 'pen' is common while in example 3 the word 'men' is common.

Now, the aligning of the two statements (propositions) does mean that the pair of statements must be written in such a way that the common term is the predicate of the 1st sentence and the subject of the 2nd.

Just think over the following examples :

Statements :

I. Some girls are (cute).

II. All (cute) are tall.

Here, the common term cute is the predicate of the I statement and subject of the 2nd statement. Therefore, the two statements (I & II) are properly aligned. But see another example.

Statements :

I. Some (bats) are chairs.

II. Some cats are (bats).

Here, the sentences are not aligned as the predicate of the 1st statement is not the subject of the 2nd.

Then how to align it ? In such type of cases we change the order of sentences. In another words we put I sentence in place of II and II in place of I :

II. Some cats are (bats).

I. Some (bats) are chairs.

Therefore, as per the requirement and nature of the sentence the alignment is done.

(i) only by changing the order of sentences.

or

(ii) only by converting of the sentences.

or

(iii) By changing the order of the statements and then converting one of the sentences.

IEA Rule

Alignment must be done in IEA order. It does mean that if the two statements are I & E then the conversion must be done for I and for E & I it will be done for E.

After discussing all the minute things about this chapter, now we have come at the position of solving the problems of syllogism.

METHODS:

(1) By Analytical Method

(2) By Venn Diagram

(1) **Analytical method :**

This method has two main steps:

(a) Aligning the pair of sentences.

(b) Using conclusion table to draw conclusion.

EXAMPLE **Statements :**

I. All rats are cats.

II. All rats are men.

When aligned it takes the form as

I. Some cats are (rats) [I type]

II. All (rats) are men [A type]

Now we use the conclusion table given in this chapter that says

I + A = I type of conclusion.

Therefore, the drawn conclusion must be

"Some cats are men"

It is clear that the conclusion drawn "Some cats are men" is a mediate inference as it is the result of two propositions. But in actual problem immediate inferences are also given in conclusion part and that format is given below :

EXAMPLE **: Statements:**

I. All rats are cats.

II. All rats are men.

Conclusion:

(i) Some cats are men.

(ii) Some men are cats.

(iii) Some rats are cats.

(iv) Some cats are rats.

(v) Some rats are men.

(vi) Some men are rats.

Here, all the options are correct. **conclusion** (i) follows because it is the mediate inference of statements I & II.

Conclusion (ii) is the conversion of conclusion (i) conclusion (iii) is the immediate inference (conversion) of statement I while conclusion (iv) is the conversion of conclusion (iii).

Conclusion (v) is the immediate inference (conversion) of statement II while conclusion (vi) is the conversion of conclusion (v).

Further, in some problems complementary pairs are also seen in th e conclusion part in the forms of sentence given below:

(a) (i) Some cats are rats.
(ii) Some cats are not rats] I - O pair

(b) (i) All cats are rats.
(ii) Some cats are not rats.] A - O pair

(c) (i) Some cats are rats.
(ii) No cats are rats.] I - E pair

Apart from I - O, A - O and I - E pair the two sentences must have some subject and predicates as are the above mentioned pairs. for these pairs we write the form 'Either (i) or (ii) follows.

METHOD TO SOLVE

(a) First step is aligning the sentences.
(b) Second step is using conclusion table.
(c) Third step is checking immediate inferences.
(d) Fourth step is checking through the conversion of immediate inferences & immediate inferences.
(e) First step is checking the complementary pairs.

(2) **Venn diagram method for solving problems :**

Students will have to adopt three steps to solve the syllogism problems through Venn diagram method :

METHOD TO SOLVE

(a) 1st step is sketching all possible pictorial representation for the statements separately.
(b) 2nd step is combining possible pairs of these representations of all the statements into one.
(c) 3rd and final step is making interpretation of this combined figure.
Conclusions are true if they are supported by all the combined figures in 2nd step.

EXAMPLE

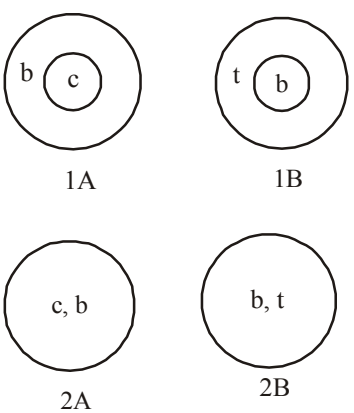
Statements :

A. All chairs are books.
B. All books are ties.

Conclusions :

I. Some ties are books.
II. Some ties are chairs.

1st Step :

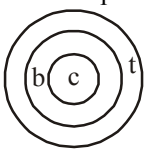


Here, 1A and 2A are representations for statement A while 1B and 2B are representations for statement B. In these representations

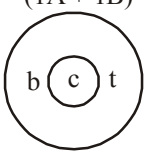
b = books
c = chairs
t = ties

2nd step :

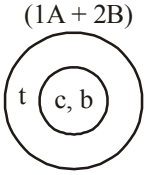
Let us combine all the possible pairs of this pictorial representations :



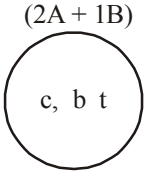
(1A + 1B)



(1A + 2B)



(2A + 1B)



(2A + 2B)

3rd step :

When we interpret the pictures in step II, we find that all the pictures support both the conclusions. Therefore, conclusion I :

"Some ties are books" and

conclusion II.

"Some ties are chairs"

both are true.

Note : *In the Venn diagram method, any conclusion given with any problem will be true if and only if it is supported by all the combined pictorial representations through 2nd step. If any pictorial representation contradicts the given conclusion, it will be put in the category of incorrect or wrong conclusion.*

POSSIBILITY

Possibility is a concept of inconsistency for an event which is not yet verified but if true would explain certain facts or phenomena.

Generally, the meaning of possibility is probability, *viz*. possibility exists where nothing is certain between the objects. In general language determination of possibility exist easily in that condition when between two objects have no certainty or the truth facts accordingly.

Let's understand below table in which possibility exists where no definite relation occurs between the objects and definite or proper relation between the objects eliminate existance of any possibility. In simple way given condition eliminates the possibility and improper condition favours the possibility. Here, we can go through with an example which will also clear the term possibility.

Condition	Possibility
Given facts	cannot be determined
Imaginary facts	can be determined

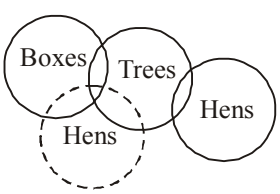
EXAMPLE

Statements Some boxes are trees
Some trees are hens.

Conclusions

I. Some boxes being hens is a possibility

II. All trees being hens is a possibility



In Conclusion I, before deciding the possibility between boxes and hens, we must notice the relation between both, we find that there is no relation between boxes and hens, so possibility favours the condition and the conclusion I is true for possibility and in Conclusion II we must notice the relation between trees and hens. We find that both have some type of relation between them so the possibility of 'All between trees and hens is true. Hence, both the Conclusions I and II follow.

❑ Shortcut Approach

Given Exclusive Proposition	Desired Proposition	Possibility
All	All	×
Some	Some	×
No	No	×
No	Some not	×
Some	All	✓
No proper relation	Some All	✓

***Note*:** Improper relation between two objects favours the possibility (In above example Conclusion I)

SPECIAL CASES OF EXCLUSIVE PROPOSITION

If the statement is of	Conversion	Illustration	Meaningful Conversion
Much, more, many, very, a few, most, almost	Some	Most A are B. A few X are Y.	Some A and B. Some X or Y.
Atleast	Some	Atleast some A are B.	Some A and B.
Definitely	No use	Some A are definitely B. Some X are definitely not Y.	Some A are B. Some X are not Y.
Only		Only A are B.	All B are A.
1% to 99%	Some	38% A are B. 98% X are Y.	Some A are B. Some X are Y.

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