Syllogism

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 propositions

WHAT IS A 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 not 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

WHAT IS A CATEGORICAL PROPOSITION?

Let us see the sentences given below:

"All M are P"

"No M are P"
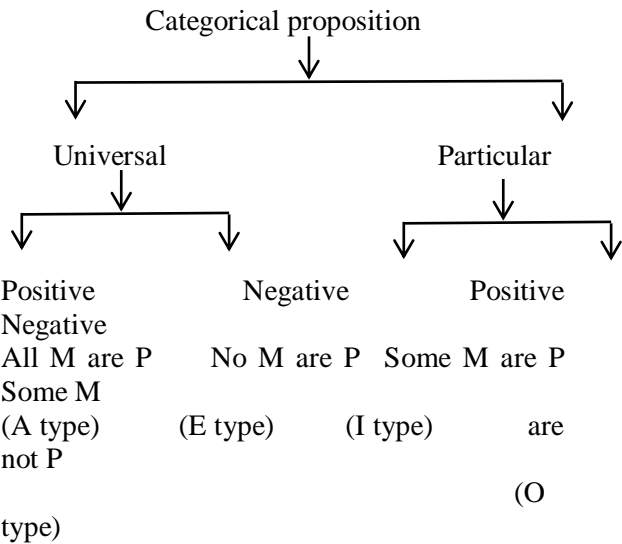
"Some M are P"

"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 Propositions 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 space categorical proposition:

It can be understood by the diagram given below

Categorical proposition

Universal   Particular

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

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 (1 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:

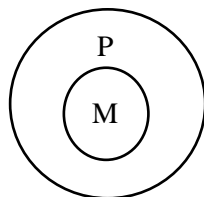| Format		Type
All M are P	-	A
No M are P	-	E
Some M are P	-	I

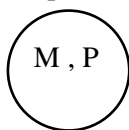Some M are not P -   O

Venn Diagram:

All A, E, I and O type of propositions can also be represented in pictorial way and this method is known as Venn diagram.

(i)   **Representation of "All M are P" (A type):**

Here, the whole circle denoting M (all M) lies inside the circle denoting P. The other possibility is as picture given below:

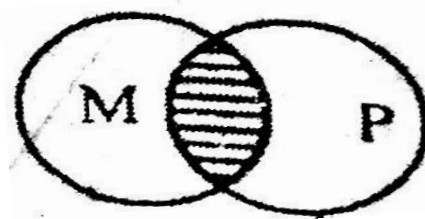**(ii)**   **Representation of "No M are P" (E type):**

Here, the circle denoting M and P do not intersect at all and therefore, truely represents   "No M are P"

(iii)   **Representation of "Some M are P" (I type):**
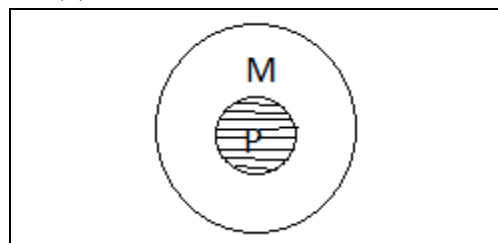
This representation will be in two ways:

Either (a):

Here it is clear from the picture that shaded part of M is some part of P and shaded part of P is some part of M. Thus "Some M are P". Similarly, unshaded part of M is not P and unshaded part of P is not M. Thus it represents "Some M are not P".
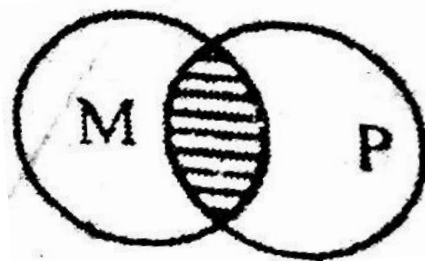
Or (b):

Here, only shaded part of M is P also. Thus we can say "Some M are P."

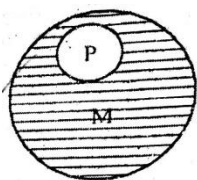**(iv)**   **Representation of "Some M are not P" (O type):**

This representation will be in three ways:

Either (a):

Here, unshaded part of M is not a part of P. Thus it represents "Some M are not P." But the shaded part represents "Some M are P".

Or (b):

Here, shaded part of M is not a part of P. Thus it represents "Some M are not P" and the circle denoting P represents "All P are M".
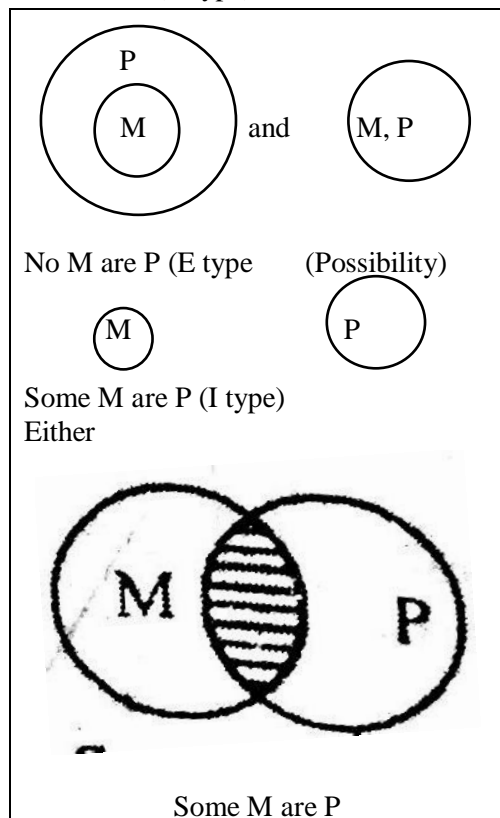
Or(c):

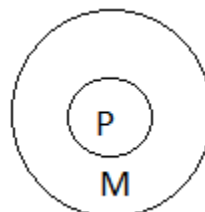It is clear from this pictorial representation that this represents "Some M are not P" and "No M are P" as well.

Now we can make a summary of Venn diagram:

All M are P (A type):

Some M are P

[Some M are not P]

(Or)

Some M are not P(All pare M)

How to identify hidden propositions.?

(i)   A type: Apart from 'all' it starts with every, each and any.

EXAMPLE:1.

Every girl is beautiful.
[All girts are beautiful.]
Each of them is healthy.
[All (of them) are healthy.]
Any one could kill the lion.
[All can kill the lion.]

Further, let us see the sentences given below:

He should be amended Bharat Ratna
↓   ↓
Subject   Predicate

Amitabh Bacchan is not a great actor.
↓   ↓
Subject   Predicate

Thus, a positive sentence with a particular person as its subject is A type. Also, a sentence in the following format is A type:

definite exception
↑
"All girls except Reeta are healthy."

(ii)   **E type:** Apart from 'no' this type of propositions starts from 'no one', 'none', 'not a single' etc.

EXAMPLE: 2.

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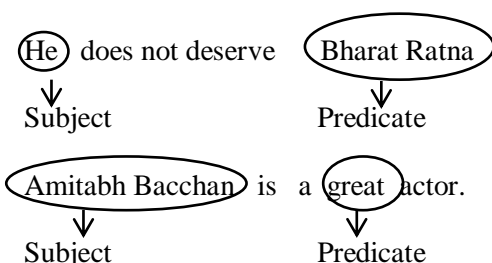
[No student is studious]

None of the girl is beautiful.

[No girl is beautiful]

Not a single girl is healthy.

[No girl is healthy].

Further, let us see the sentences given below:

He does not deserve Bharat Ratna

Subject   Predicate

Amitabh Bacchan is a great actor.

Subject   Predicate

Thus, a negative sentence with a particular person as its subject is E type proposition.

Also, sentences in following formats are E type:

definite exception

"No student except Reena has failed"

"Is there any truth left in the world"

[No truth is left in the world.]

(iii)   I type: A part from some it also starts with words such as often, frequently, almost, generally, mostly, a few most etc.

EXAMPLE:3.

Almost all the girls are beautiful.

[Some girls are beautiful].

Most Of the garments are handmade.

[Some of the garments are handmade].

Usually girls are beautiful.

[Some girls are beautiful.]

A few money are left in my wallet.

[Some money are left in my wallet].

Further, let us see the sentences given below:

Few girls are not studious.

[Some girls are studious.]

Rarely is a girl not beautiful.

[Some girls are beautiful].

Seldom are women not housewife.

[Some women are housewife].

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 :

> Not a definite exception as name of girls are not given.

All girls except a few are beautiful.

[Some girls are not beautiful]

> Not a definite exception as name of girls are not given.

All girls except 5 have passed.

[Some girls have passed]

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

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

EXAMPLE:4.

All girls are not beautiful.

[Some girls are not beautiful]

Every boy is not present.

[Some boys are not present.]

Further, let us see the following sentences:

Poor are usually not healthy.

[Some poor are not healthy]

Almost all the girls are not beautiful.

[Some girls are not beautiful.]

Most of the garments are not handmade.

[Some of the garments are not handmade.]

Girls are not frequently short tempered.

[Some girls are not short tempered].

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:5.

Seldom are women jealous.

[Some women are not jealous]

Few girls are beautiful.

[Some girls are beautiful]

Rarely is a wealthy person worried.

[Some wealthy person are not worried.]

Also, see the following formates:

> No a definite exception as name of girls are not given.

No girls except three are beautiful.

[Some girls are not beautiful.]

> No definite exception as name of women are not given.

No women except a few are housewife.

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

IDENTIFYING 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: 6.

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 proposition:

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

Conversion of A type:

Subject   Predicate
↑   ↑
"All (M)   are   P" (A type)

After conversion it becomes.

Subject   Predicate
↑   ↑
"Some (P) are   M" (I type)

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

Conversion of E type:

Subject   Predicate
↑   ↑
"No (M)   are   P" (E type)

After conversion it becomes.

Subject   Predicate
↑   ↑
"No   (P) are   M" (E type)

Therefore, E get converted into E. "sss"

Conversion of I type:

Subject   Predicate
↑   ↑
"Some (M)   are   P" (I type)

After conversion it becomes.

Subject   Predicate
↑   ↑

"Some P are M" (I type)

Therefore, 1 get converted into I.

Conversion of O type:

O type of proposition can't be converted.

Note: In each conversion, subject becomes predicate and predicate become 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.

Now we can make a short table of conversion to remember.

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	III 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 1st 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 1st 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 7.

Statements:

I. All girls are beautiful.

II. Some girls are Indian.

EXAMPLE 8.

Statements:

I. No pen is chair.

II. Some tables are pen.

EXAMPLE 9.

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 7 the word 'girl' is common; in example 8 the word 'pen' is common while in example 9 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:

III. Some cats are bats.

I. Some bats are chairs.

Let us consider another pair of statements.

I. All bats are chair.

II. All bats are cats.

Then how to align it ? In fact, in such cases we do alignment in two ways:

I. by converting statement 1 as .

I. Some chair are bats.

II. All bats are cate.

and

II. by changing the order of the sentences and then converting the statement II.

Now 1st change the order as

I All bats are cats.

II All bats are chair.

Again we do conversion for II and the aligned pair takes the form as

D. Some cats are (bats).

L All (bats) are chair.

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 if 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. This chapter suggests two 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 10.

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 = 1 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 11.

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 rate.

(v)   Some rats are men.

(vi)   Some men are rats.

Answer options:

(a)   only (iii) follows

(b)   only (i), (ii) and (iii) follow

(c)   only (iv) follows

(d)   all follow

(e)   none of these

Here, the correct option is (d).

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 the conclusion part in the forms of sentence given below:

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

(i) some cats are rats.	I-E pair
(ii) No cats are rats	

Apart from I-O, A-O and I-E pair the two sentences must have same subject and predicate as are the above Mentioned pairs. For these pairs we write the form Either (i) or (ii) follows

For example, see the following format:

EXAMPLE 12.

Statements:

1.   Some dogs are cats II. Some cats are rats. **Conclusions:**

(i)   Some cats are dogs.

(ii)   Some rats are cats.

(iii)   All cats are rats.

(iv)   Some dogs are rats.

(v)   Some dogs are not rats.

Answer options:

(a)   All Follow.

(b)   Only (i) follows.

(c)   Only (ii) and (iii) follow.

(d)   Either (iv) or (v) and (i) & (ii) follow.

Here, option (d) is correct because conclusion (i) is the immediate inference (conversion) of statement I while conclusion (ii) is the immediate inference of II. Conclusion (iv) & (v) make complementary pair of I+O type. Conclusion (iii) is not correct because I and II are I type of statements and I + I does not give any conclusion. Further, A type of conclusion can not be find from the immediate inferences (conversion) of I type of statements as I & II are. Now, the complete process of solving Syllogism problems can be summaried as below:

(a)   1st step is aligning the sentences.

(b)   2nd step is using conclusion table.

(c)   3rd step is checking immediate inferences.

(d)   4th step is checking through the conversion of immediate inferences & mediate inferences.

(e)   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:

(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. Now let us solve a problem.
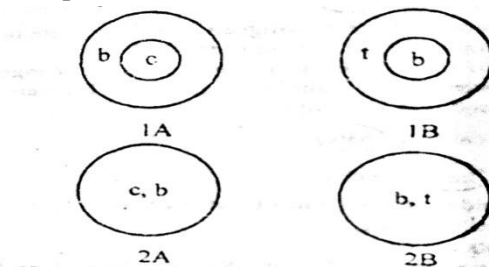
EXAMPLE 13.

Statements:

A. All chairs are books.

B. All books are ties.

Conclusions:

1. Some ties are books.

2. 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.
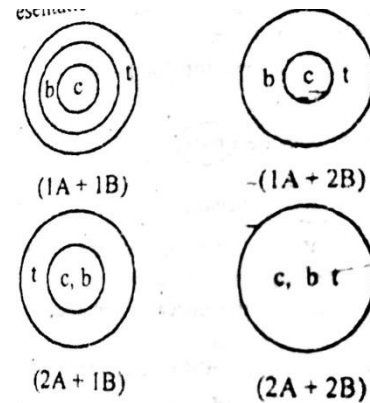
b = books

c = chairs

T = ties

2nd Step:

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

(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.

Important 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.