SYLLOGISM

Learning Objectives

- Introduction
- What is a Proposition?
- How to Identify Hidden Proposition?
- Identifying Exclusive Propositions
- Conversion of Propositions
- Rule to Draw Conclusion
- What is Aligning?
- How to Solve Problems?

Introduction

"Syllogism" is a Greek word that mean inference or deduction.

In 'Reasoning', syllogism is a kind of logical argument that applies deductive reasoning to arrive at a conclusion, based on two or more propositions that are asserted or assumed to be true.

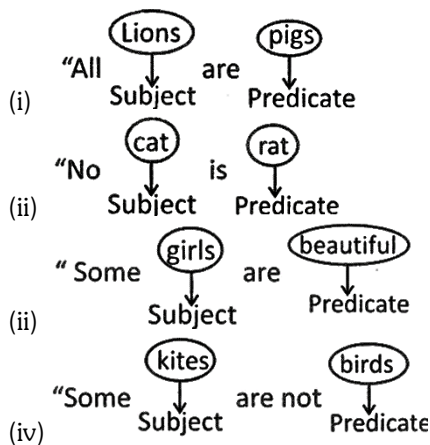The problems of syllogism is based on two parts:

    (i) Proposition

    (ii) Conclusions/conclusions drawn from given proposition/propositions,

What is a Proposition?

A proposition is a sentence which affirms or denies a predicate of a subject.

"All men are mortal" In this example the subject is "All men" and the predicate "are mortal"

Just consider the sentences given below:

All the sentences mentioned above give a relation between subject & predicate. Here, it is clear from the sentences that a subject is the part of sentence of which 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 give a relation between two terms. St has three parts:

    (A) The subject (M)

    (B) The predicate (P)

    (C) The relation between subject & predicate

What is a Categorical Proposition?

Let us see the sentences given below:
      (i) "All M are P"
      (ii) "No M are P"
      (iii) "Some M are P"
      (iv) "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 no-categorical proposition which is in the format "If M then P".

Types of Categorical Proposition

It can be understood by the diagram given below:
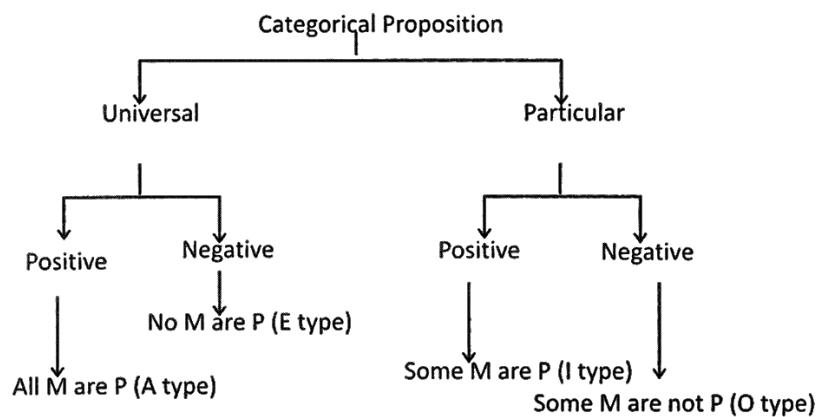
Therefore, it is clear, that universal propositions either completely include the subject (A type) or completely exclude it (E type). On the other hand, particular propositions either only partly include the subject (I type) or only partly exclude the subject (O type).
Now we can summarize the four types of proposition 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

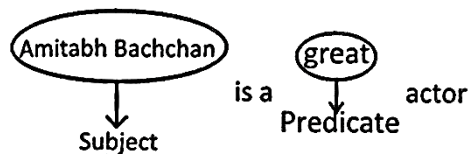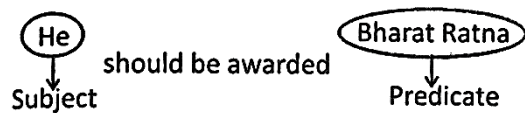# How to Identify Hidden Proposition?

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

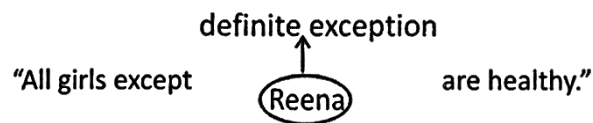**Example:**

      Every girl is beautiful.
      [Alt girls 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 — Subject
should be awarded
Bharat Ratna — Predicate

Amitabh Bachchan — Subject
is a
great — Predicate
actor

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

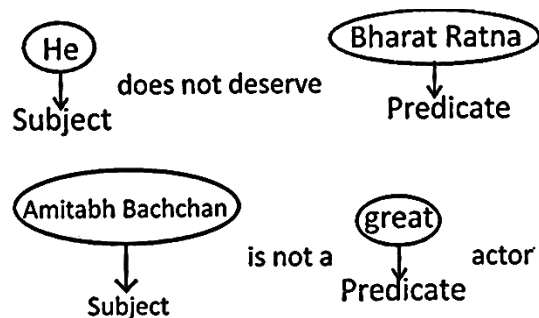**Also, a sentence in the following format is A type:**

definite exception

"All girls except Reena are healthy."

E Type

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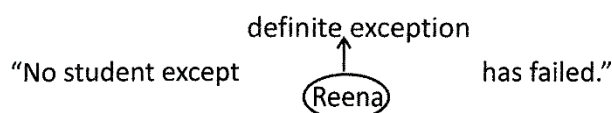**Example:**

No one (student) is studious.
[No student is studious]
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 — Subject
does not deserve
Bharat Ratna — Predicate

Amitabh Bachchan — Subject
is not a
great — Predicate
actor

Thus, a negative sentence with a particular person on 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.]

I Type

Apart from 'some' it also starts Word 'such', 'no', 'often', 'frequently', 'almost', 'generally', 'mostly', 'a few', 'Most' etc.

Almost all the girls are beautiful.

Example:

[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 little money is left in my wallet.
[Some money is 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 given examples that negative sentence beginning with wards like 'few', 'rarely', 'seldom', etc. (also 'hardly', 'scarcely', 'little' etc.) are to be reduced to I type.

Just see the other formats given below:

Not a definite exception as
Name of girls are not given

All girls except (a few)↑ are beautiful

[Some girls are 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.

O Type

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

Example:

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:

The 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 0 type propositions.

Again positive propositions starting with words like 'few', 'scarcely', 'rarely', 'little', 'seldom' etc. are said to be 0 type.

Example:

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 persons not worried]

Also see the following formats:

Not a definite exception as name of girls are not given

No girls except (three) are beautiful.
[Some girls are not beautiful]

Not a definite exception as name of women are not given

No women except (a few) are housewife.
[Some women are not housewife]

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

Identifying Exclusive Propositions

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

Example:

Only graduate are probationary officers.

- No graduate are probationary officer (E type)
- All probationary officers are graduate (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)

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 proposition:

Conversion of A type

after conversion it becomes

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

Conversion of E Type

after conversion it becomes

Therefore, E get converted into E.

Conversion of I Type

after conversion it becomes

Therefore, I get converted into I.

Conversion of O Type

O type of proposition can't be converted.

Note: *In each conversion, subject becomes predicate and medicate becomes subject.*
Infect, conversion is an immediate inference that is drawn from two propositions are called mediate inference.

Now we can make a short type 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 a single proposition or from two propositions. But a conclusion drawn from a 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:

I Proposition	II Proposition	Conclusion
A	A	A
A	E	E
E	A	(O)R
E	I	(O)R
I	A	I
I	A	I

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 1

Statements: **I.** All (girls) are beautiful.

II. Some (girls) are Indian

Example 2

Statements: **I.** No (pen) is chair

II. Some tables are (pen).

Example 3

Statements: **I.** Some women are (men)

II. No (men) is chair.

In all the above mentioned examples, 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 the over the following examples:

Statements: **I.** some girls are (cute) .

II. All (cute) are tall.

Hence, 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 (cute) are chairs.

II. Some cats are (cute) .

Here, the sentences that 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

II. Some cats are (bats) .

I. Some (bats) are chairs.

Let us consider another pair of statements
I. All bats are chairs.
II. All bats are cats.

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

(a) by converting statement I as

I. Some chair are (bats) .

II. (bats) are cats.

and

(b) by changing the orders of the sentences and then converting the statement II.
Now 1st change the order as:
II. All bats are cats.
I. All bats are chairs.
Again we do conversion for II and the aligned pair takes the form as

II. Some cats are (bats) .

I. All $\boxed{bats}$ are chairs.

There for, 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 one of the sentences.

　　　　or

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

I E A Rule: Alignment must be done in I E A order. It does mean that if the two statements are I & E then the conversion must be done for I and for E & A, 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.

How to solve problems?

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 $\boxed{rats}$. [I type]

　　　　II. All $\boxed{rats}$ 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:-

Statement:　**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.

Answer option:

　　　　　　(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 statement 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 sentences 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 object 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:
Statements: **I.** 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   (a) All follow
                  (b) Only (i) follows
                  (c) Only (ii) and (ill) follow
                  (d) Either (iv) or (v) and (i) & (ii) follow

Here, option (d) is correct because conclusion (i) is the immediate inference (conversion) of statements 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 A type of statements and I + I does not give any conclusion. Further, A type of conclusion cannot be found from the immediate inference (conversion) of I type of statements as I & II are.

Now, the complete process of solving syllogism problem can be summarised as below:
    (a) 1st step is aligning the sentence.
    (b) 2nd step is using conclusion table.
    (c) 3rd step is checking through the conversion of immediate inference & mediate inference.
    (d) 4th step is checking through the conversion of immediate inference & mediate
    (e) Checking the complementary pairs.

Directions: In each of the questions given below are two or three statements, followed by two or three conclusions. You have to take the given statements to be true even if they seem to be at variance from commonly known facts. Read the conclusions and then decide which of the given conclusions logically follows from the given statements disregarding commonly known facts.

Statements: **I.** All computers are televisions.
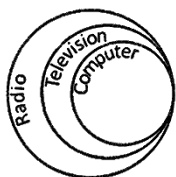   **II.** All televisions are radios.

Conclusions: **I.** All computers are radios.
                  II. Some televisions are computers.
                  III. Some radios are televisions.

(a) Only I follows   (b) Only II follows
(c) Only III follows   (d) All follow
(e) None of these
Answer: (d)

Explanation: Option (d) is correct
Let us

All computers are (televisions) (A type)

All (televisions) are radios (A type)

A + A = A type of conclusion
= All computers are radios = Conclusion I.
Conclusion II and III are the conversions of statements II and III respectively as A types of statements get converted into I type. II and III are immediate inferences of statements I and II respectively.
Rest of the options is incorrect because of the correctness of option (D).

Statements: **I.** Some bats are balls.
                II. All balls are rackets.
Conclusions: **I.** Some bats are rackets.
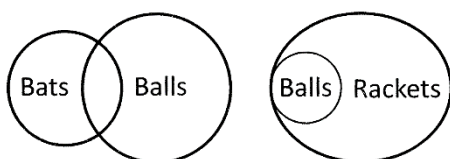   **II.** No bats are rackets.
(a) II follows
(b) I follows
(c) Either I or II follows
(d) Both follow
(e) None of these
Answer (b)

Explanation: Option (B) is correct.
Let us see:

From statement I and II.

Some bats are (balls) (I type)

All (balls) rackets (A type)

I + A = I type of statement
= Some bats are rackets

Type of conclusion.
Rest of the options Is incorrect because of the correctness of option (B).

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Statements: I. All Ds are Ps.
II. All Ps are Ts.

Conclusions: I. Some Ps are Ts.
II. All Ds are Ts.
III. Some Ts are Ds.
(a) I follows   (b) Only III follows
(c) I, II and III follow   (d) Only II follows
(e) None of these
Answer (c)

Explanation: Option (c) is correct.
Let us see

All Ds are (Ps) (A type)
All (Ps) are Ts (A type)

A + A = A type of statement
= All Ds are Ts = conclusion II.
Conclusion I is converse of statement II.
And conclusion III is the conversion of conclusion II because A type of statement get converted into I type. You may say also that conclusion III is the immediate inference of conclusion II.
Rest of the options is incorrect because of the correctness of option (C).

Statements: I. Some dogs are cats,
II. Some cats are rats.
Conclusions: I. Some cats are dogs.
II. Some rats are cats,
(a) Both follow   (b) Only I follows
(c) Only II follows   (d) Either I or II follows
(e) None of these
Answer (a)

Explanation: Option (a) is correct.

In fact, conclusion I and II are the immediate inferences of statements I and II respectively because both are I type of statements and I type of statements get converted into I type.

Further, statements I and II together cannot give any mediate inference as two I types of statements do not give any conclusion.
Rest of the options is incorrect because of the correctness of option (A).

Statements: I. All cows are lions.
II. All lions are tigers.
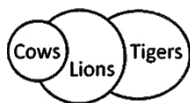III. No tigers are monkeys.
Conclusions: I. All cows are tigers.
II. No cows are monkeys.
III. No lions are monkeys.
(a) Only I follows   (b) Only II follows
(c) Only III follows   (d) All follow
(e) None of these
Answer: (d)

Explanation: Option (d) is correct.
Let us see:

From I and II,

All cows are (lions) (A type)

All (lions) are tigers (A type)

A + A = A type of conclusion (A type)

= All cows are tigers = Conclusion I.

From conclusion I and statement II,

All cows are (tigers) (A type)

No are monkeys (E type)

A + E = E type statement

= No cows are monkeys = conclusion II

From statement II and III,

All lions are (tigers) (A type)

No (tigers) are monkeys (E type)

A + E = E type conclusion = No lions are monkeys = Conclusion III

Clearly, (D) is the correct answer.

Rest of the options is incorrect because of the correctness of option (D).