**Research Methodology**
**Prof. Soumitro Banerjee**
**Department of Physical Sciences**
**Indian Institute of Science Education and Research, Kolkata**

**Lecture - 11**
**Logical Reasoning: Syllogistic Logic Part 02**

In the last class we were dealing with Syllogistic Logic.

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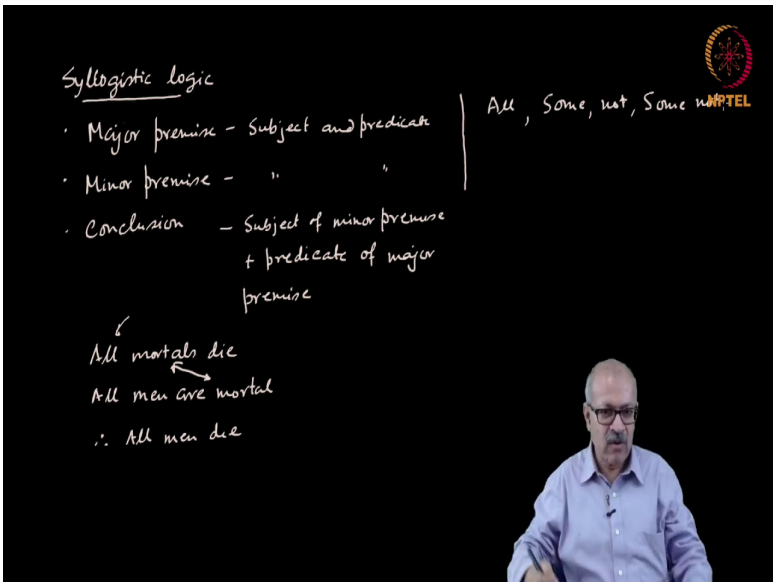


And we have seen that in syllogistic logic, the deduction is based on a major premise and a minor premise, and from there we draw a conclusion. A major premise has subject and predicate. Similarly, the minor premise has subject and predicate. And when we draw the conclusion, then that relates the subject of minor premise and the predicate of major premise.

So, that was the style of a logical structure, the argument. For example, suppose the major premise is, ‘all mortals die’ and then, minor premise ‘all men are mortals’ therefore, all men die. A simple line of logic. Now here, this is the minor premise, its subject is ‘all men’ and the major premise its predicate is ‘die’ and then, the ‘mortal’ is the middle term that gets eliminated.

And that is the general structure, and Aristotle showed that there are four types of qualifiers like ‘all’ is a qualifier. That way there are four qualifiers: all, some, not and some not. This is what we did in the last class. And then, I started with some examples of logical reasoning. Today we will continue with that. So, we are continuing with some examples of logical reasoning, but today we will use, in the main, Venn diagrams to logically deduce what can be a deduction.

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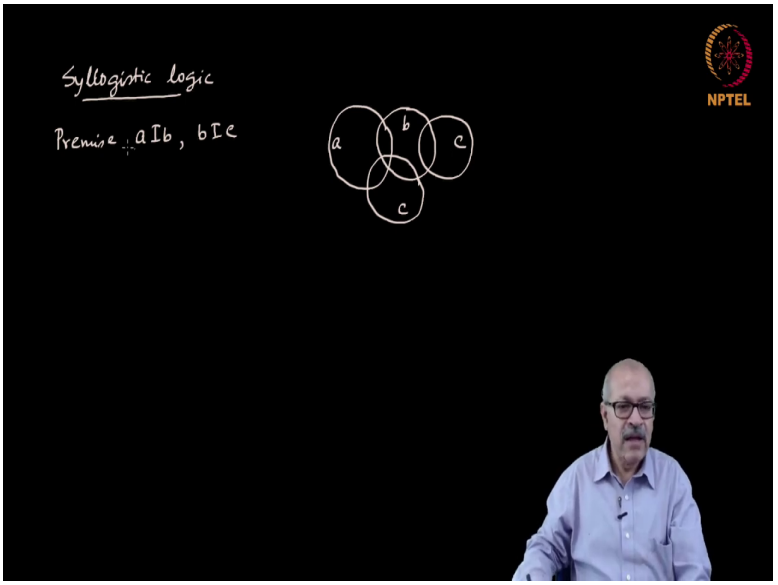


For example, suppose the premise given are aIb and bIc, which is ‘some a are b’ and ‘some b are c’. In that case your Venn diagram would be that there will be a one circle or blob of a and there is a blob of b. There will be, a has a overlap with b, and b has a overlap with c.

Obviously, you can deduce from here that ‘some a are b’ is given, ‘some b are a’ that is also a possible deduction. Similarly some c are b that is also a possible deduction. But since the given premise does not talk of any particular relationship between a and c, therefore, we cannot draw any conclusion about the relationship between a and c.

Notice that happens when the c blob can be placed, from the given premise, either here or here—both are possible. So, whenever two possible positions are

there, you know that you cannot draw any definite conclusion out of that, but both are possibilities. Let us go on.

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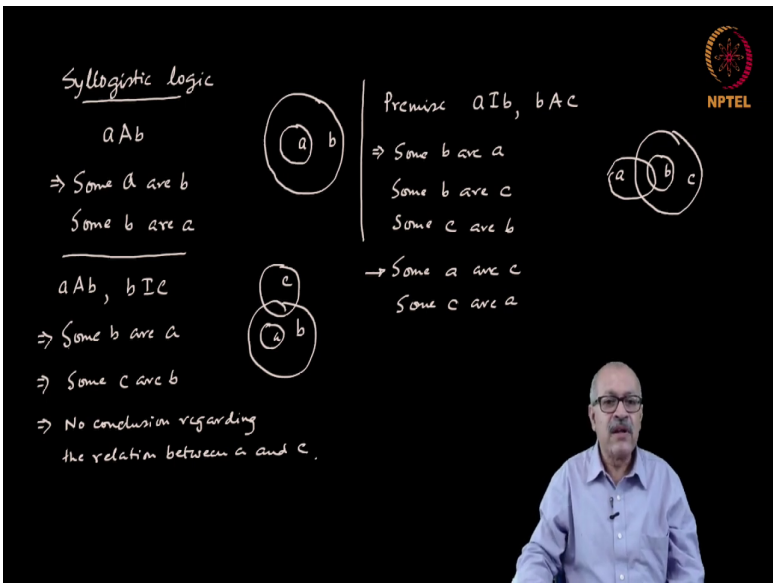


If the premise given is only aAb, which means that ‘all a are b’, then the Venn diagram will be one enclosed in the other. Your a is enclosed in b. What can you conclude out of that? Obviously the conclusion will be that if all a is b, then ‘some a are b’ is also a possible conclusion. And then, some b are a — that is also possible. So, from the premise given, what can you conclude is the general question that we are facing.

Now, suppose we have a situation where the premise given are aIb, which is ‘some a are b’ and bAc: ‘all b are c’, then what can you conclude out of that? Again we will draw a Venn diagram and try to figure it out. You see, a and b have an overlap. Then all b are c. So, what can you conclude out of this situation?

You can definitely conclude between a and b, since some a are b, so also some b are a. That is also possible. That is between a and b. Between b and c, all b are c and we have already seen that leads to the conclusions some b are c, some c are b.

Now, between a and c what can you conclude? Since b is enclosed in c and a has a overlap with b and therefore, a necessarily has a overlap with c. Therefore we can say some a are c, some c are a. So, these are the things that we can conclude out of a situation like this.

Normally, in an exam question, we take any of these and then we ask whether from the given premise that can be concluded or not. For example, suppose this is given as a possible conclusion and then you are asked whether this follows as a necessity out of the premise given. In this case it does.

Suppose I change the premise a bit and I make aAb and bIc. So, it is just the opposite of that. It is clear that it would be similar, but the positions will be a bit different. So, a will be enclosed in b, and c will have a overlap with b. Then we can say nothing about a and c, the relationship between a and c, and we can draw similar conclusions as we did earlier between b and c.

So, what we can conclude in this case? We can conclude: it was given a is enclosed in b. So, we can say some b are a. Between c and b, it is already given that some b are c. Some c are b—this you can conclude. And no conclusion on relation between a and c.

So, often the questions come giving some specific relationship between a and c, for example ‘some a are c’, and you are asked whether that can be concluded out of that or not. Then you have to figure out that cannot be concluded. That remains a possibility, but definitely that does not come as a necessity.

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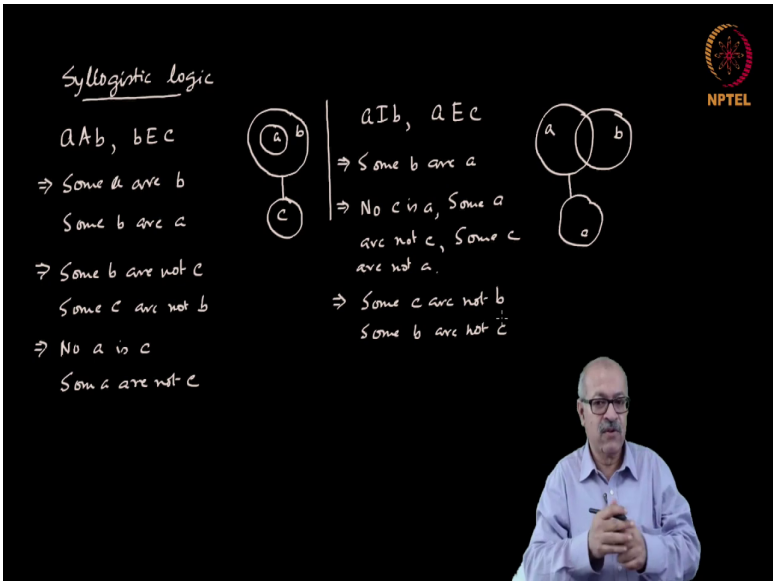


Now, let us go ahead. We have to do a few more examples. For example, if you take a situation where the premises that are given are aAb and bEc. So, all a are b, no b are c. In that case, all a are b means a is a blob, b is a bigger blob enclosing it. No b is c, so, c is somewhere here and there is b; there is a distance between them. So, there is no link between these two and then, what can you conclude out of this situation?

What we can conclude are, between a and b: if it is enclosed we know that we can write some a are b, some b are a. Between b and c, ‘no b is c’ is given and if this is true, then we can also write ‘some b are not c’, that is also definitely true. If this is true, this is by definition true. Then ‘some c are not b’ is also true.

Then between a and c, since a is completely enclosed in b and c is having no intersection with b, therefore, a cannot have an intersection with c. So, again, ‘no a is c’ is possible. If that is so, then we can also write ‘some a are not c’. If that is so, the opposite is also true: ‘some c is not a’ and so ‘no c is a’. I mean, these are obvious.

So, you see, in every case you are having to extract the possible deductions out of that and there would be many deductions possible and you have to list all the

possible deductions and check, if a particular deduction is given whether that is true or false.

Let us do another here. I am not doing all possibilities. I am just showing some examples, I am showing how to argue and you have to adopt that argumentative style.

Suppose the premise is given aIb and aEc. So, what is this? ‘Some a are b’ and ‘no a is c’. Some a are b, and therefore, I will draw two blobs with an overlap between a and b. There will be c here, which has no overlap with a.

So, what can you conclude out of this situation? You can conclude, for example, between a and b: if some a are b, some b are a definitely. Well in some books you will find, when they show what conclusions can be drawn, they also include what is given, because that is also a definite trivial conclusion in the situation.

But we are not doing that, because that is a trivial thing. So, some b are a. Between a and c: we can say there is no common between them and therefore, we can write ‘some a are not c’, ‘some c are not a’ and all that possibility. No c is a, some a are not c, some c are not a. And then between b and c, what can we conclude? Notice that, only a does not have any overlap with c. That is given. The c blob can be placed either here or here; c can also be enclosed; c can also have a overlap. So, we do not really know.

But definitely we know that there is an overlap between a and b, and c excludes a. Therefore, there is a region with which definitely c does not have any overlap and therefore, we can say that ‘some c are not a’, ‘some a are not c’. Some c are not b, and some b are not c. So, you see that this is the way to draw conclusions out of this, but notice that here we are drawing the conclusions what necessarily follows.

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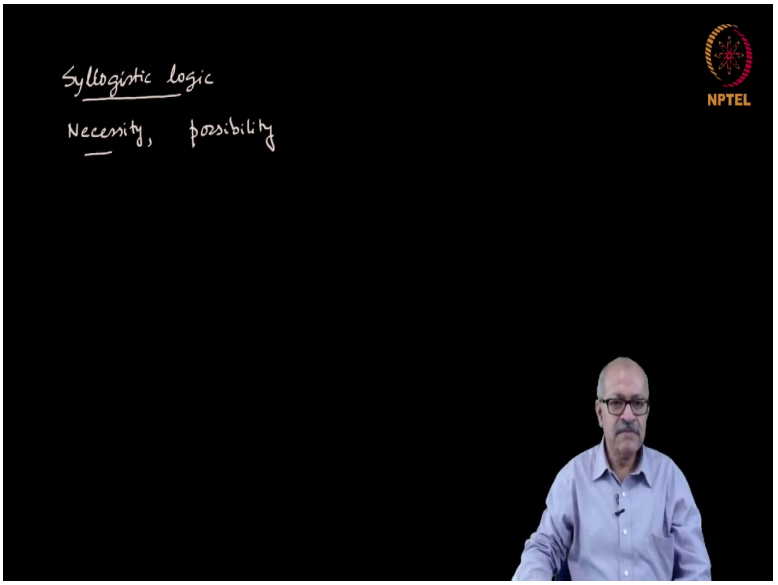


In logic you have to understand the difference between necessity and possibility. Necessity does not mean the word ‘need’, necessity means what will necessarily follow. If these are given that will necessarily follow, in that sense the word necessity used in philosophy, possibilities whether something is possible or not.

And so far what we are dealing with are the necessary conditions, necessities, but we also have to apply syllogistic logic to deal with possibilities. Given such situations, given certain premises, what are possible. Let me give an example to start with.

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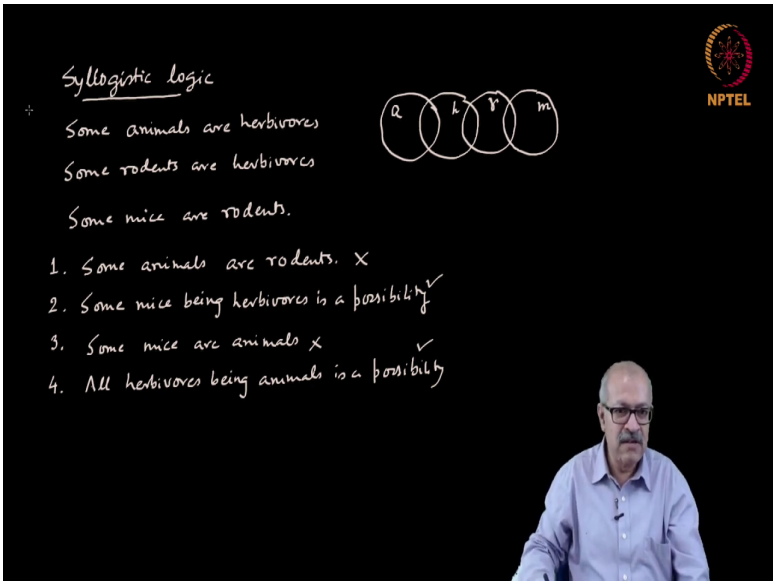


Suppose the statements given are ‘some animals are herbivores’ then, ‘some rodents are herbivores’, then ‘some mice are rodents’. So, suppose these are the premises given. On the base of these premises we can draw the Venn diagrams: some animals are herbivores, so there will be two blobs with an overlap between each other: animals a, herbivores h and then some rodents are herbivores.

So, rodents will have overlap with herbivores. And some mice are rodents. So, the mice will have overlap with rodents. In that case suppose we ask whether these can be the conclusions or not.

Suppose the 1st conclusion is, some animals are rodents. Can we conclude this? Well, you would notice that if you work from your prior knowledge it might sound right, but given the premise that are given: some animals are herbivores, some rodents are herbivores and therefore, nothing is said between the relationship between animals and rodents.

They could have an overlap, they could not have an overlap. And therefore, as a necessary conclusion you cannot draw this. So, this is actually wrong, you cannot draw this conclusion based on the premise given. So, do not base

yourself on the prior knowledge that you have, whether the statement is correct or not. You have to see whether this statement is valid based on the premises given.

Now, let us consider one ‘possibility’ statement. Some mice being herbivores is a possibility. Is that true or false? Mice here, herbivores here, what has been given does not say that there is an overlap or no overlap, but yes it could have an overlap between them. If the herbivores and the mice blobs do have an overlap, that does not violate any of the premises given, and therefore, it being possibility is true.

Let us consider the 3rd option: the possibility that some mice are animals, mice-animals from here we can draw no conclusion regarding the overlap between mice and animals and therefore this again is false.

Another possibility statement: ‘all herbivores being animals is a possibility’. Herbivores-animals: they have an overlap, some animals are herbivores. Now, if some animals are herbivores, it is possible for the herbivore blob to be completely inside the animal blob. That is also consistent with the premise given, and therefore, this is a possibility. So, the possibility exists.

So, you might be given a statement like this, which is a necessity statement. You might also be given a possibility statement like this. Now, so you have to distinguish between necessity and possibility. Aristotle showed that there are certain structures that are logically possible or logically viable structures as far as the possibility decisions are concerned. And he gave them names.

So, let us not talk about the names he gave: names like a logical structure being called ‘Barbara’ or something like that. It is not necessary for us to know that in this course.

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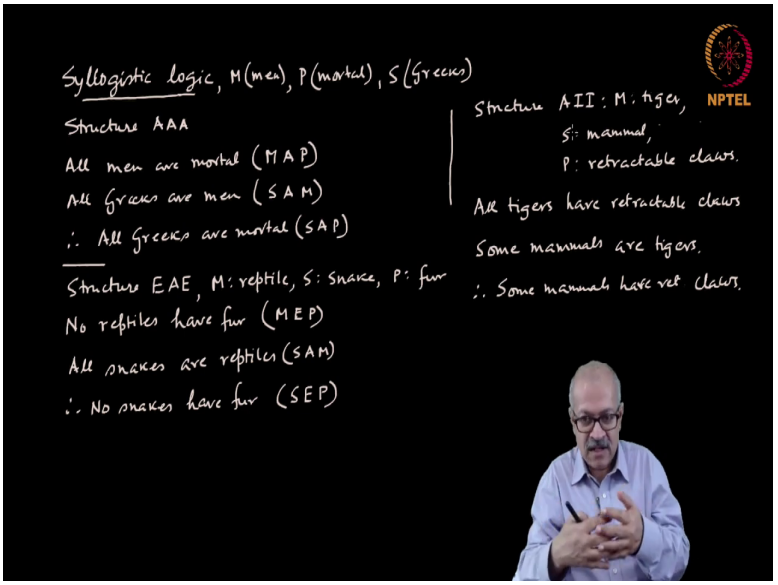


So, the structures I will now write down, some structures, say structure AAA. A, which means all. Like, men are mortal, all Greeks are men, and therefore, all Greeks are mortal. Notice that here, in the structure that has been chosen here, ‘men’ is the middle term. So, I will say middle term M is men, the predicate is ‘mortal’ and the subject is ‘Greeks’.

And in the style of argument the middle term gets eliminated and the subject of the minor term here becomes the subject of the conclusion and the predicate of the major term becomes the predicate of the conclusion. So, we can write middle term-A-predicate, subject-A-middle term, and we ultimately get subject-A-predicate. A means ‘all’ again in this case. So, a structure MAP plus SAM leads to the structure SAP.

Let us consider another structure EAE. In this structure, suppose we consider the middle term as reptile, the subject as snake and the predicate as fur. So, how do you construct these sentences? First, the premise given: E means no. So, ‘no reptiles have fur’. The second term is A, all. So, ‘all snakes are reptiles’. Then the conclusion E, subject: snakes, middle term reptiles is dropped, and the predicate is fur. The conclusion comes as ‘no snakes have fur’. So, here we

have a situation where the middle term-E-predicate and subject-A-middle term gives subject-E-predicate.

So, E plus A leads to the conclusion E. That is how this structure goes. Let us write another here structure AII. Here suppose the middle term is tiger, the subject is mammal, and the predicate is, say, retractable claws. Let me write it here: predicate retractable claws. Then the major premise will have A in it. So, ‘all’, then the middle term ‘tigers’, all tigers have retractable claws.

The second is I, I is some. So therefore, some mammals are tigers. So, this is the middle term that is just eliminated ultimately. Therefore we conclude that ‘some mammals have retractable claws’.

So, this is the structure and you would notice that this way you can construct some structures. So, A plus I leads to an I statement, ‘all’ plus ‘some’ leads to a ‘some’ statement. This kind of valid logical structures were demonstrated by Aristotle and he showed that out of all possibilities only some are valid and then he listed them. Let us work a few others.