NPTEL
NPTEL ONLINE COURSE
Discrete Mathematics
Logic
Rules of Inferences - Part 2
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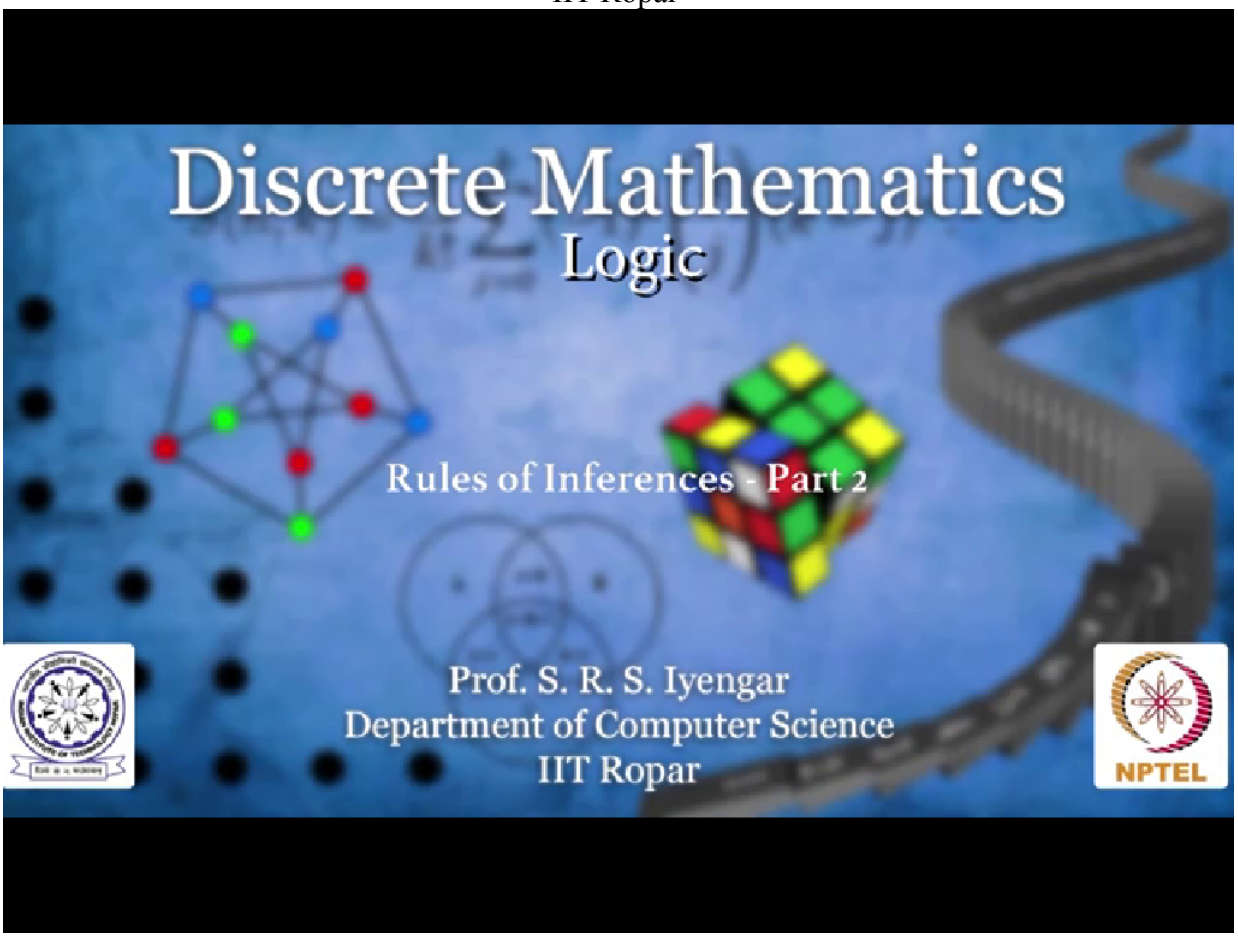
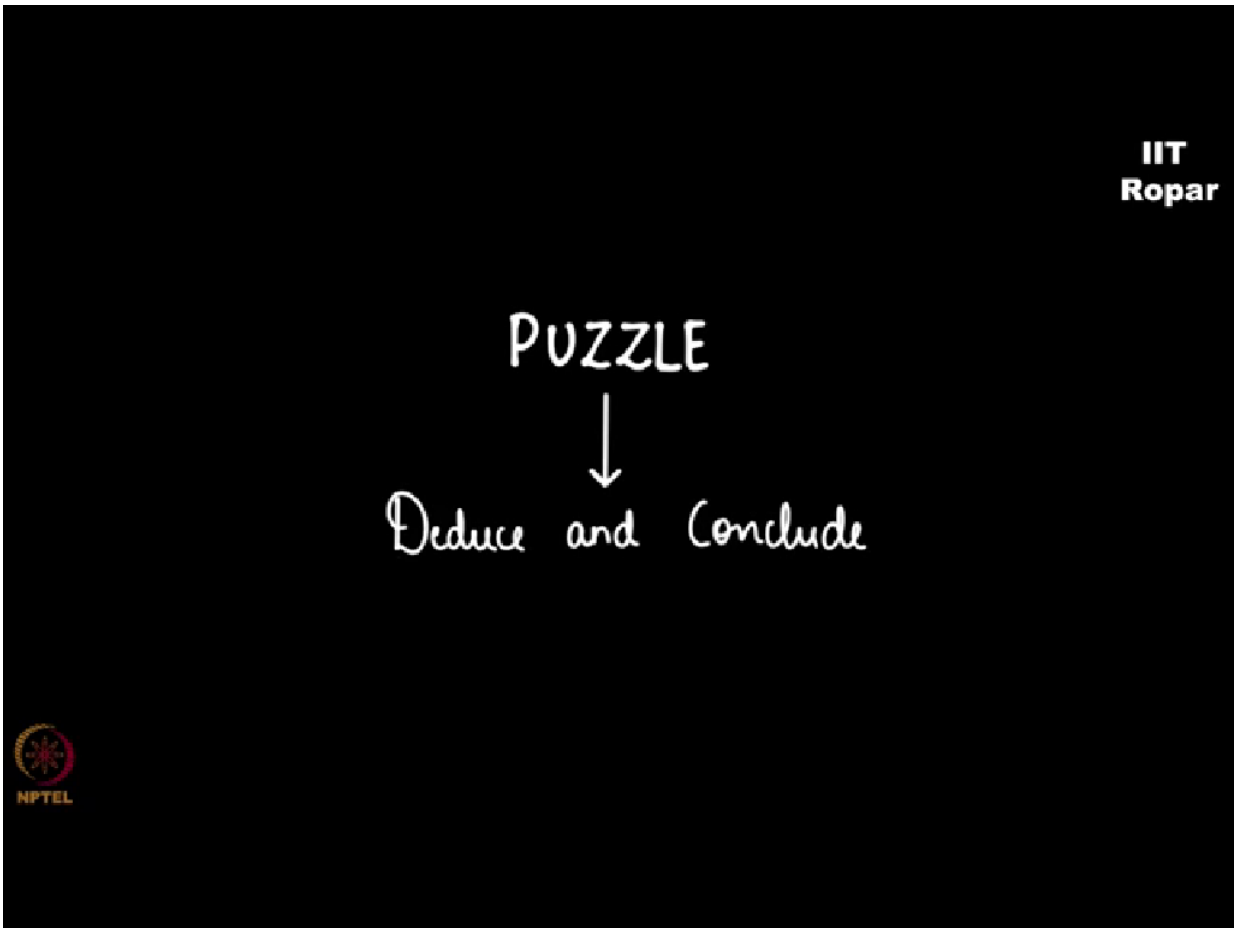
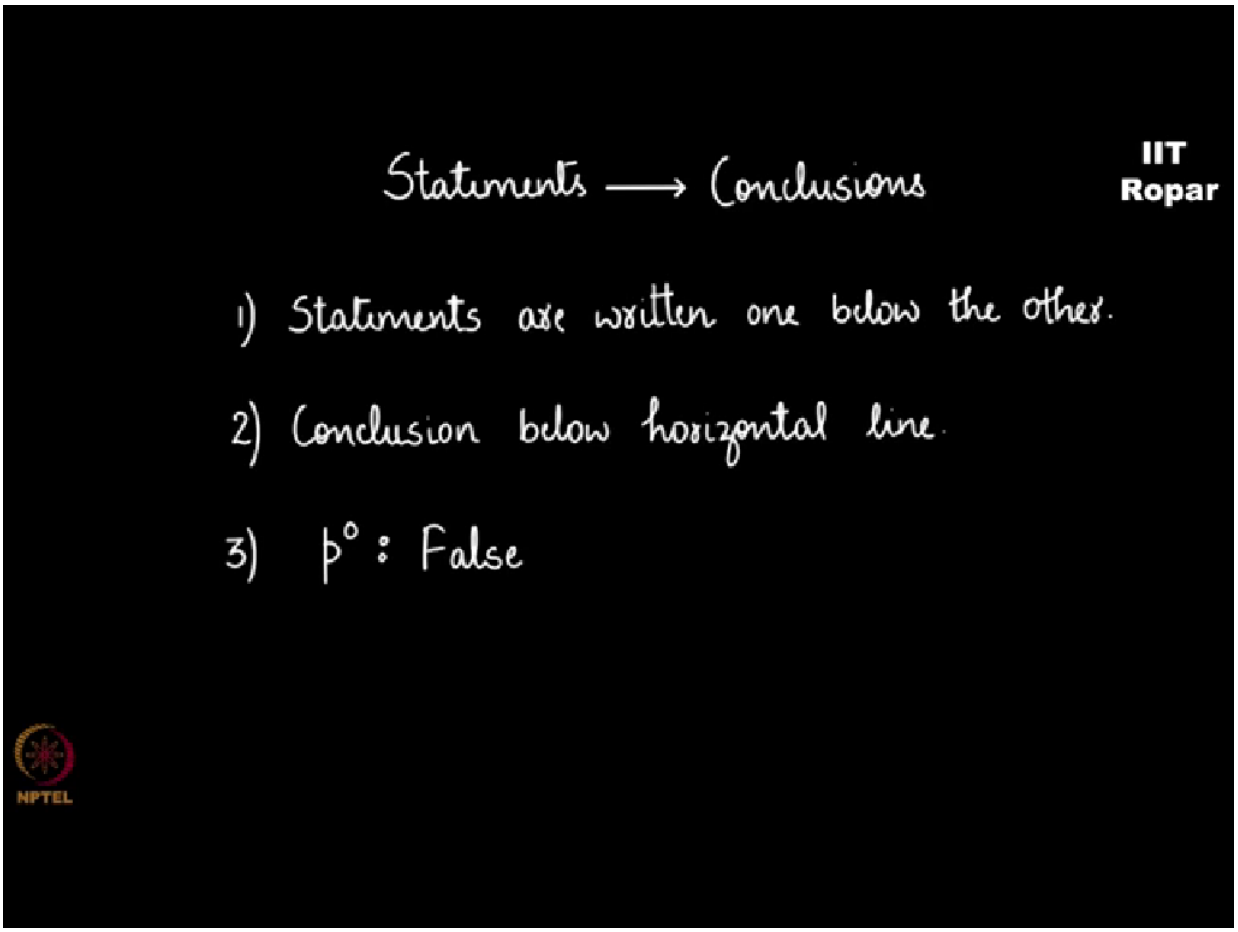


When you are given a puzzle, you have some information in your hand. We have to deduce something and conclude something.

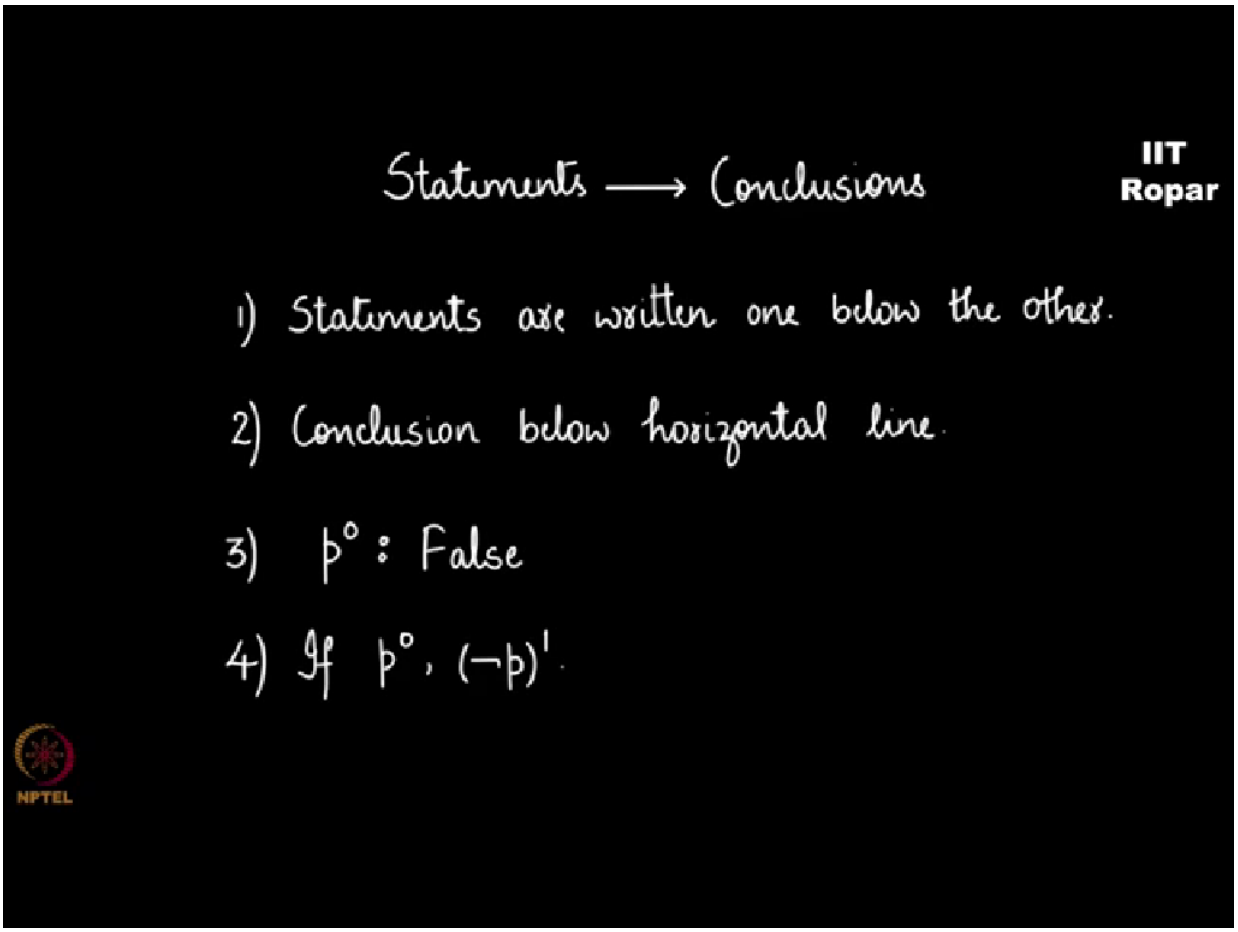


So, similarly, even in logic, sometimes we will be given statements, which are known to be true. We have to use that information and arrive at our conclusions. Following are a few points that you need to make note of. Whatever statements are given to be true, we write them one below the other.

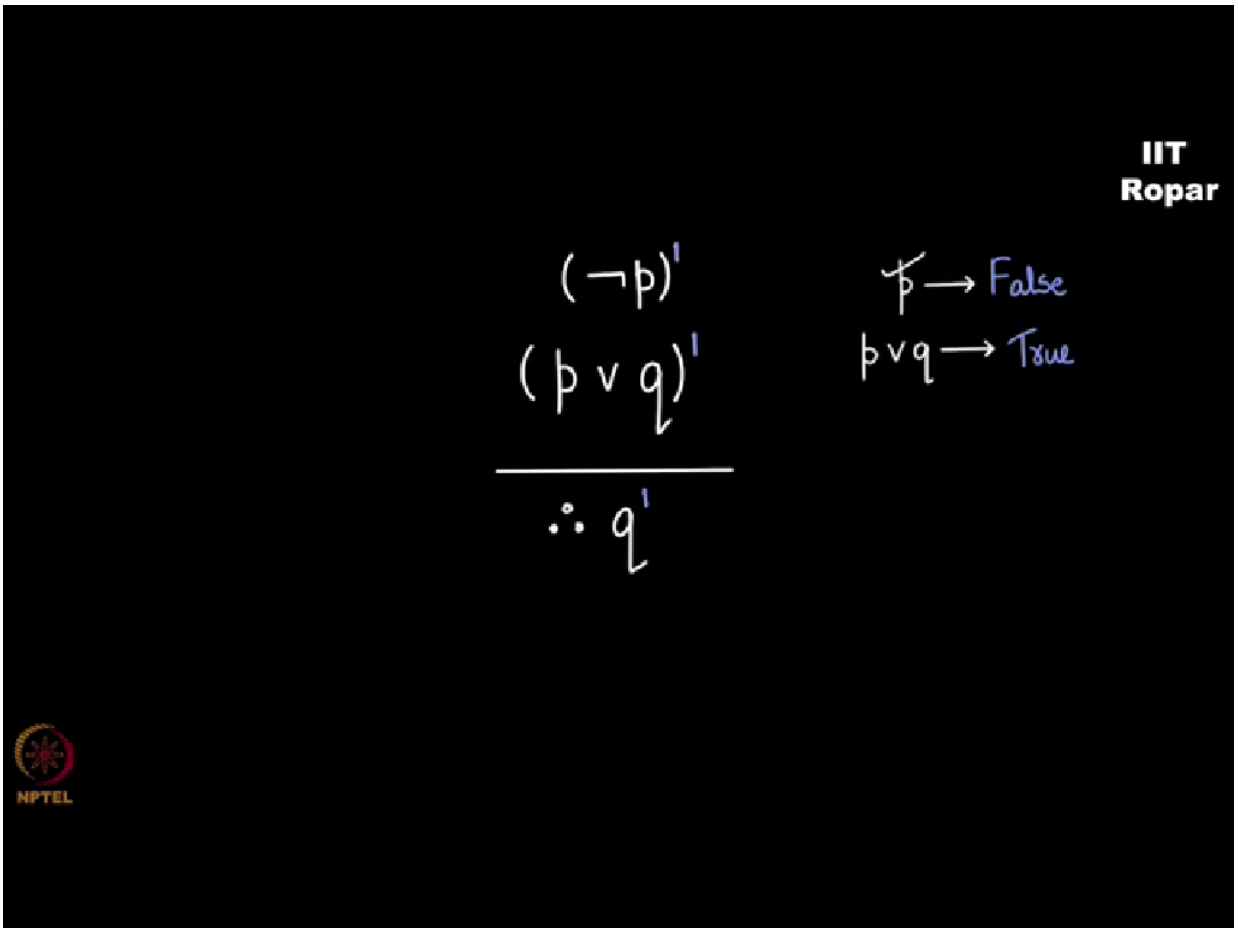
After all the given information is over, we put a horizontal line and we write conclusion just below it. Whenever we come across some primitive statement to be true, we write a 1 on top of it. If it is false, we write 0 on top of it. You will get to know as we proceed.



As you know, if some primitive statement p is false, NOT p will be true. So while writing down the information, we write it as p bar is true. Don't worry much about it. We will see a lot of problems and you will get a hang of it very soon.

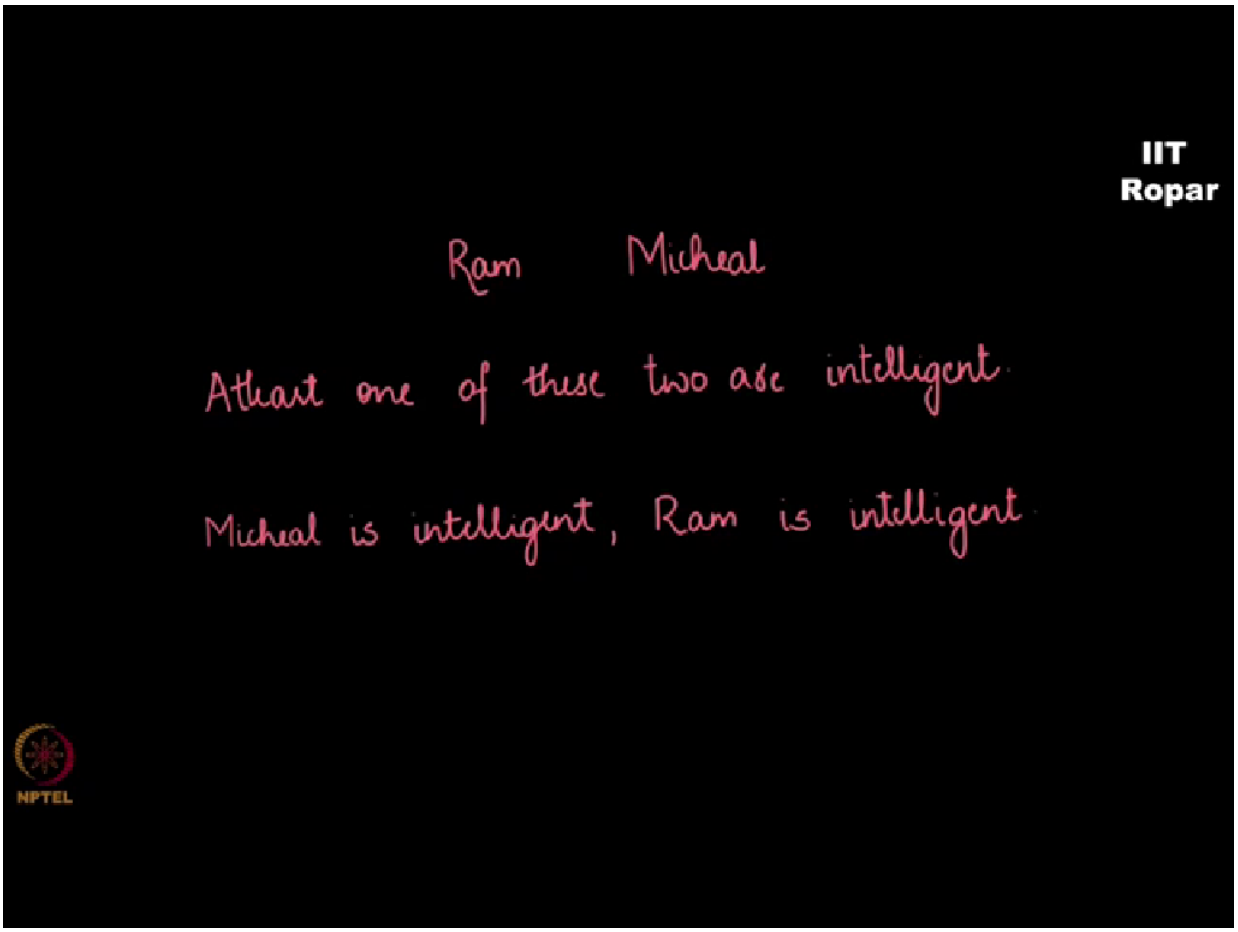


Look at this example. Given that p is not true, and given that p OR q is true, by this we mean p is known to be false, but p OR q is known to be true. This should simply mean that look, this fellow is false, p is false, and I say this OR of p AND q is true, which should imply to you that q is true. Right? I say, therefore, q is true. Right?



I am inferring some fact from the given statements.

Look at this. I tell you that look, there are these two students: Ram and Michael. Amongst Ram and Michael, at least one of them is intelligent. I say this and you also trust me. It is true that one of these two, at least one of these two are intelligent. What does that mean? That means that Ram is intelligent and Michael is not or Michael is intelligent and Ram is not or both of them are intelligent.

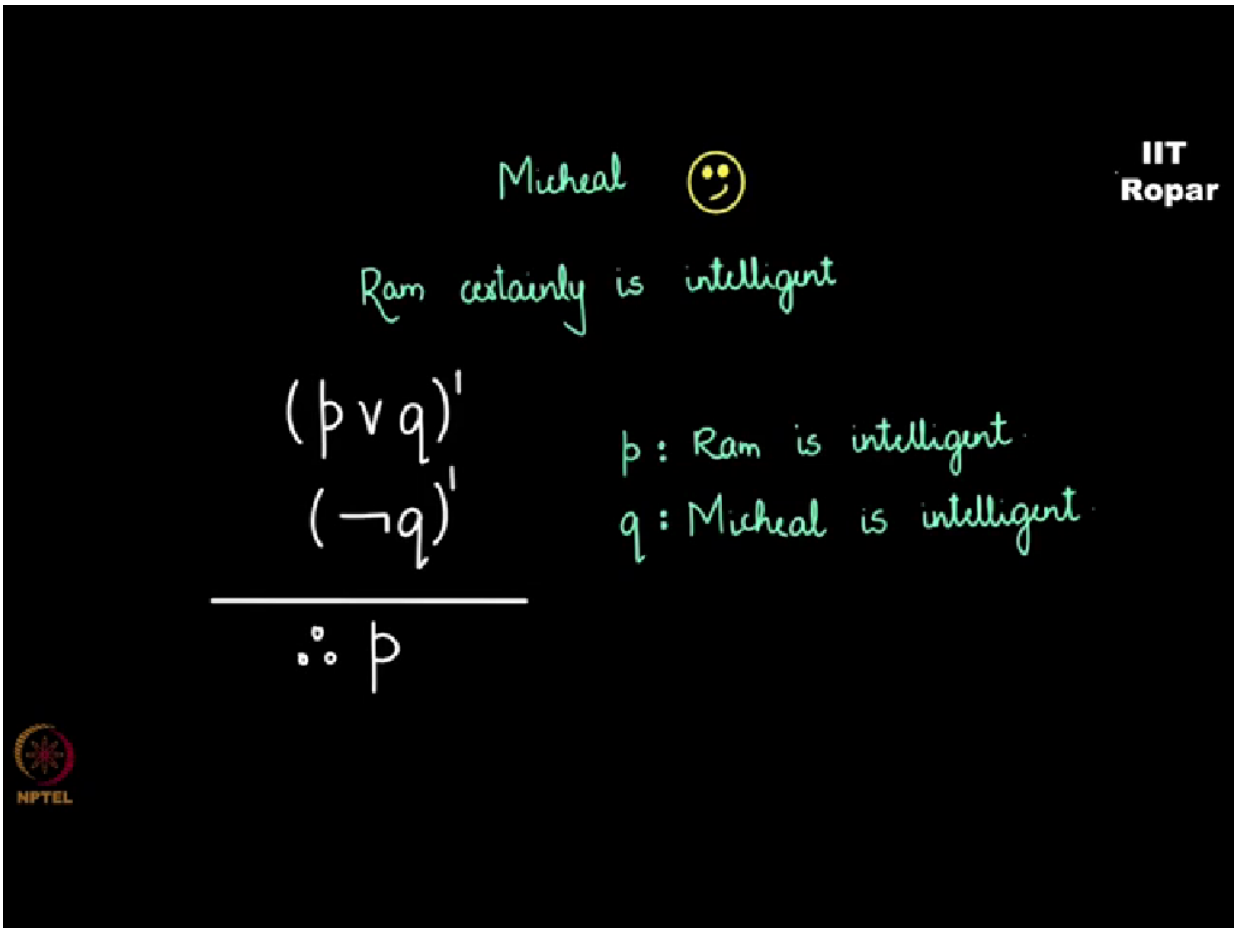


How can you consider both of them? Because look at the statement what I said above. I said at least one of them is intelligent, which means both of them can be intelligent. Okay.

Now I say this and then what you do is you interview Michael. You talk to him. You find him very dumb. Right? He doesn't know some of the basics of computer science, but he claims he knows he is a graduate in computer science.

Now what can you conclude? I have told you that it's true that one of them at least is intelligent and knows good amount of computer science, and you interview Michael, and you conclude that he doesn't know anything. What is your inference now? Your inference should be Ram certainly is intelligent. Correct? Now this is precisely what we solved before.

I told you that p OR q is true. P is Ram is intelligent. Q is Michael is intelligent. And then you saw that NOT q was true. Michael was not intelligent and therefore, you concluded that p is true. Okay?



Now this is just a – there is a small difference. P and q roles are interchanged here from the previous problem, but it is same as you can see. Right? P OR q is true. Q is not true. Therefore, p must be true.

Now do you see the importance of deducing something like this. You might be wondering such a straightforward English statement, why are we complicating by using some sophisticated mathematical logic? You will observe. There were only two statements here. What if you had 10 such statements and you were forced to conclude something? We will see more such examples where you will feel the need to write things down and then conclude something instead of using plain English logic.

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