NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Set Theory

Set difference – Part 2

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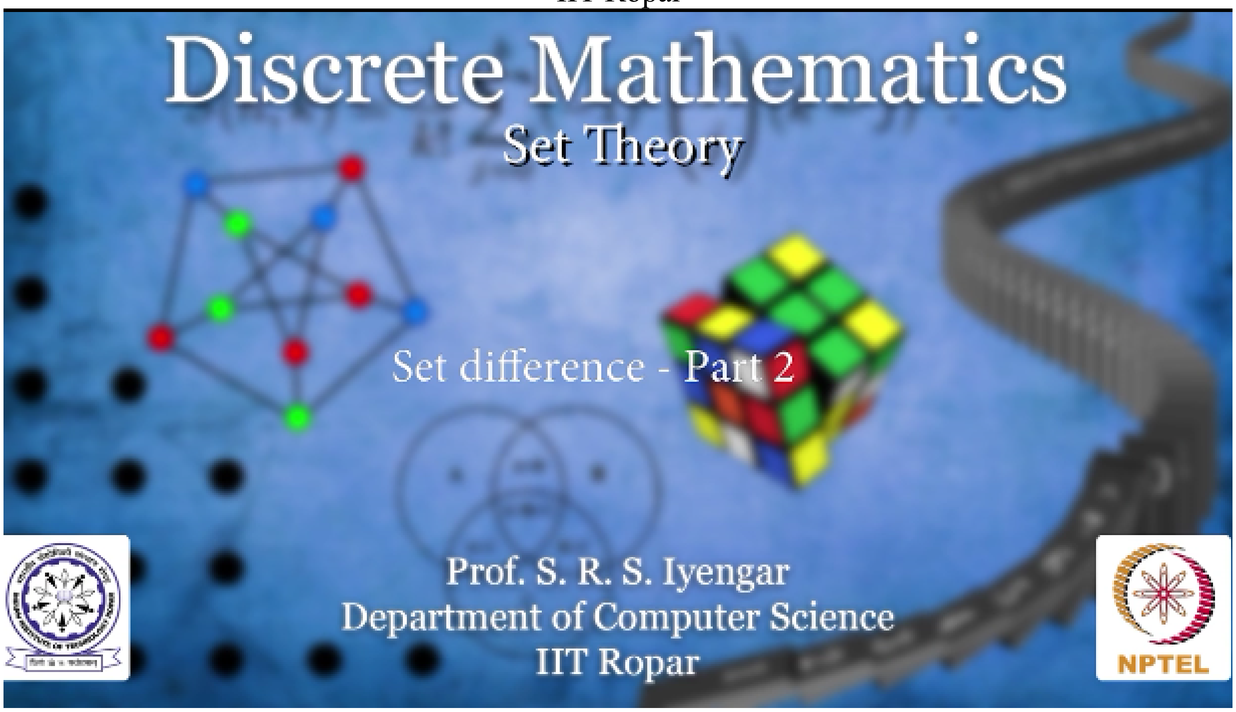
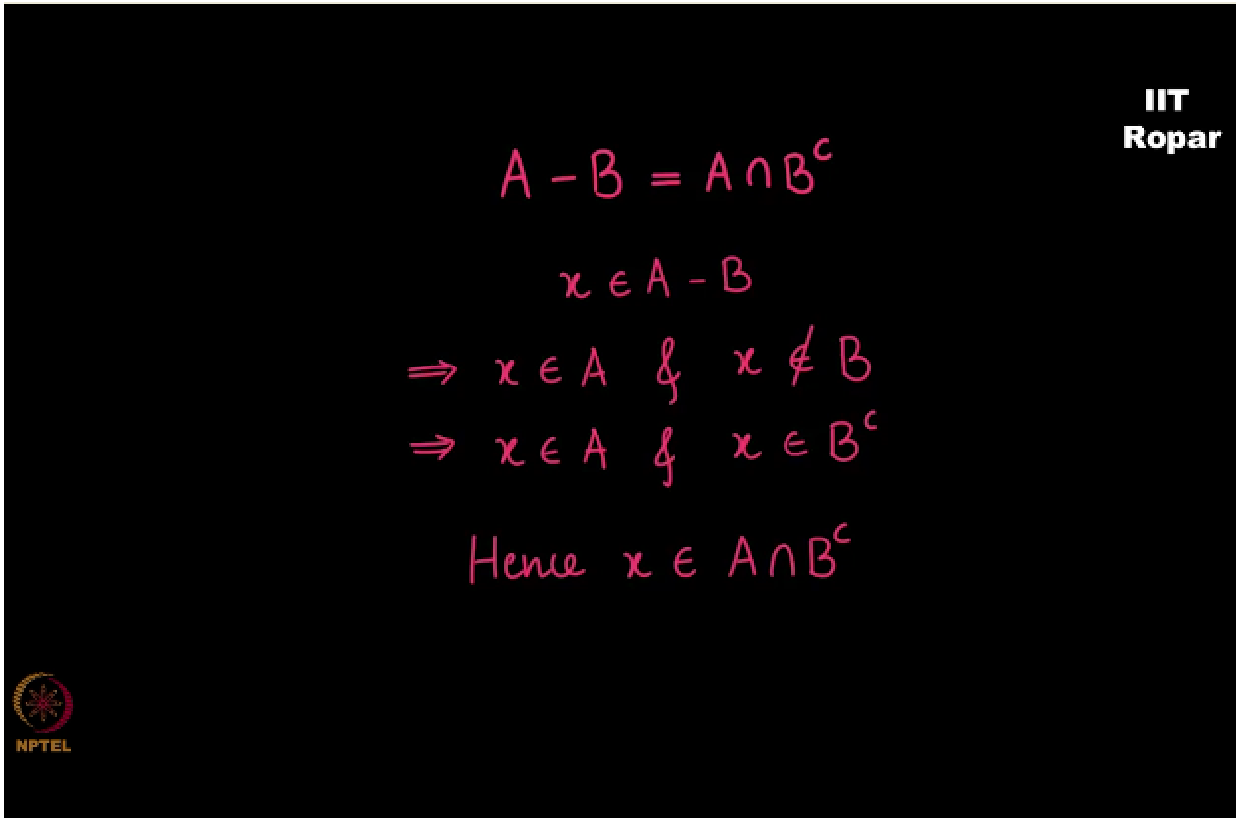
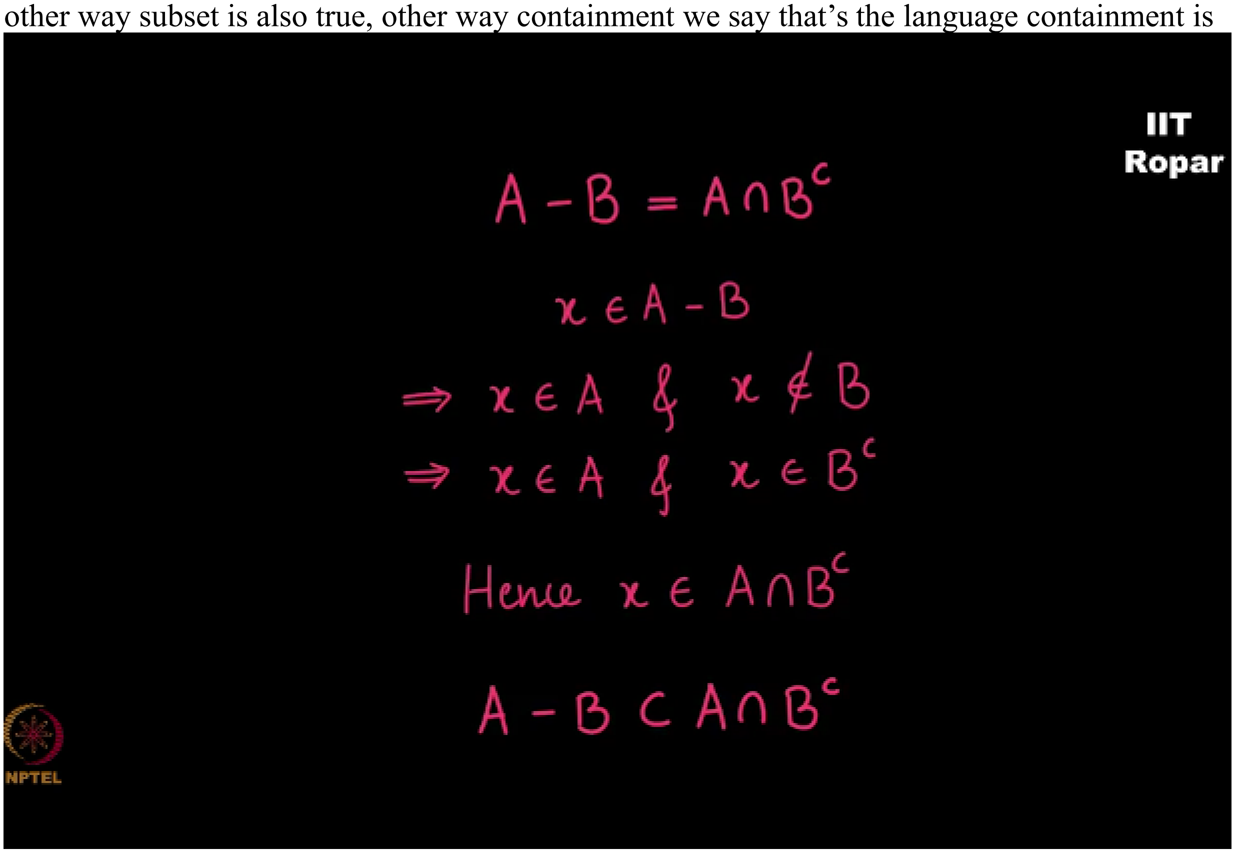


This A-B that we have been discussing has a very interesting form, and that is it is actually equal to A intersection B complement, so how is that true? Let us try proving this using the same old technique that we are advertising for a long time that is take the left-hand side show that it's subset of right-hand side and the other way around.

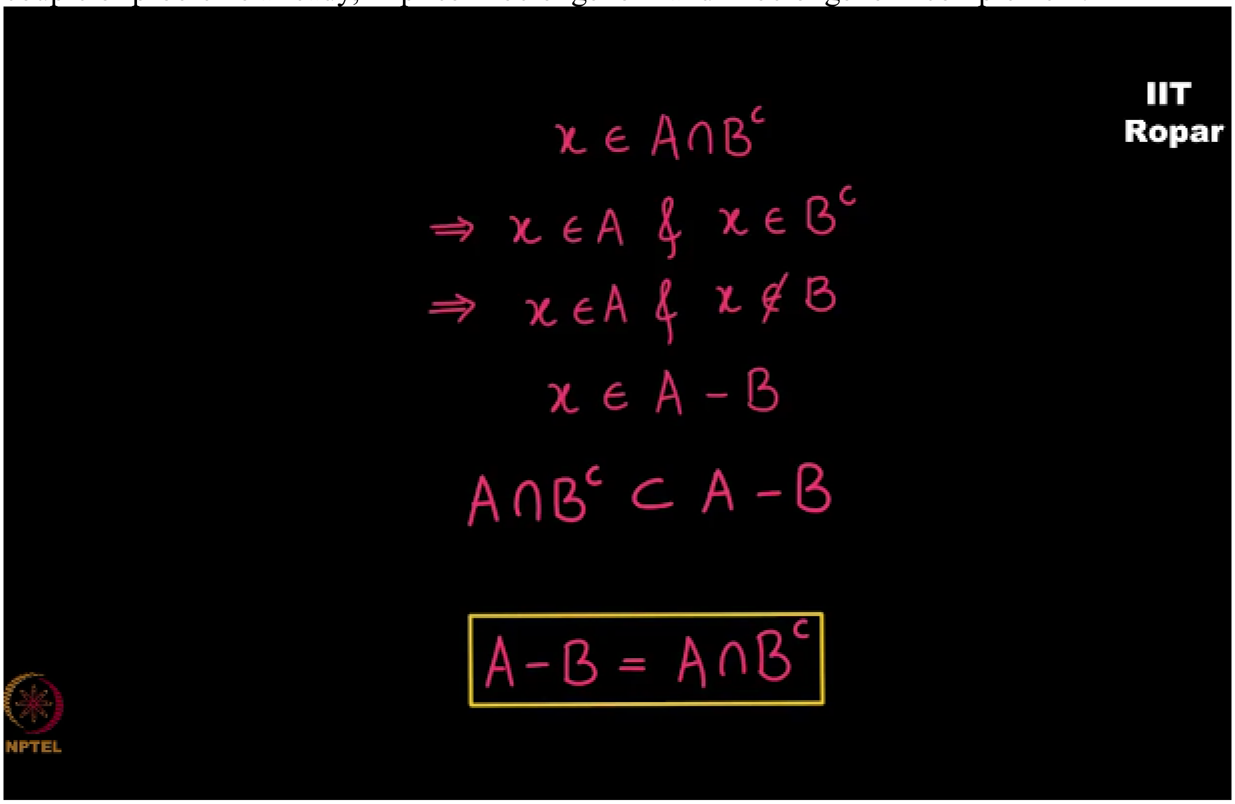
So let me take an element X belonging to A-B this implies that X belongs to A and X does not belong to B only then X will be in A-B, what does this imply? X belongs to A and X does not belong to B implies X belongs to A and X does not belong to B means X belongs to B complement, which means X is in some set and in some other set means it is there in the intersection of these two sets, and hence X belongs to A intersection B complement.



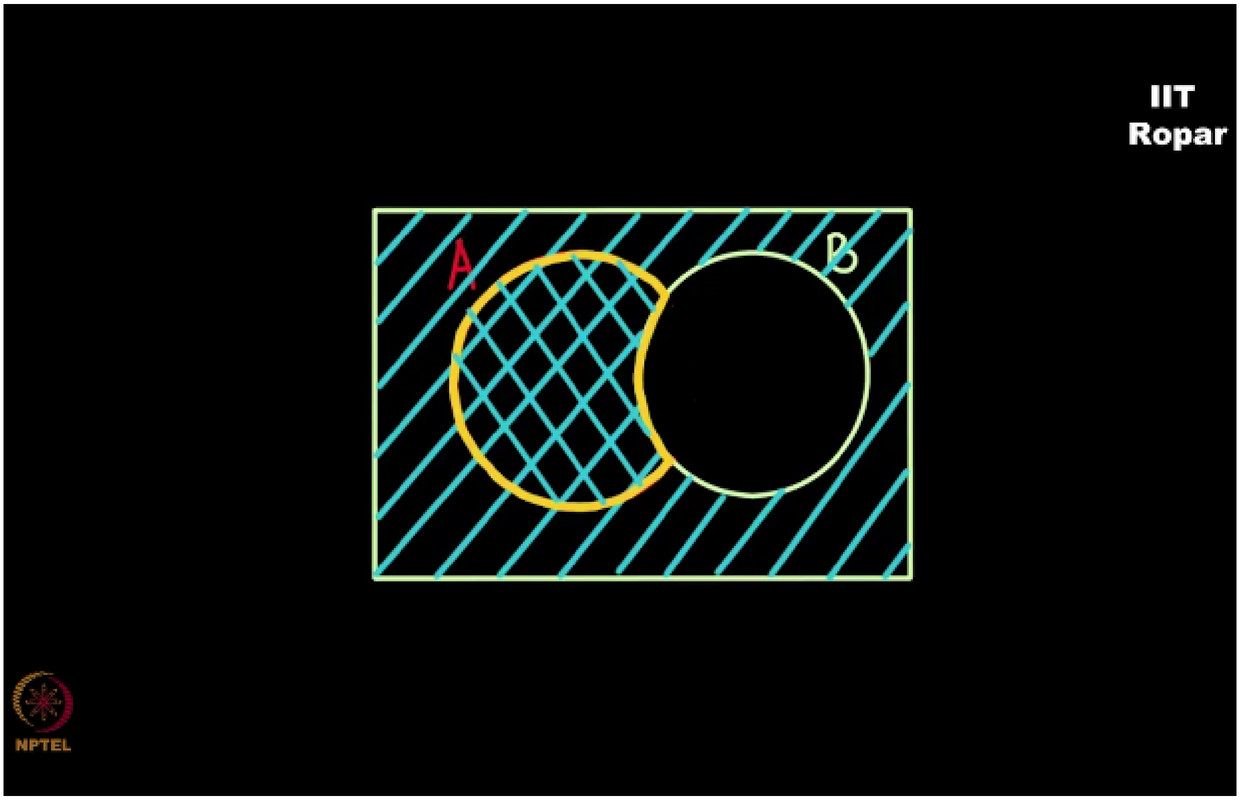
Now this means A-B is a subset of A intersection B complement, now how do we show that the other way subset is also true, other way containment we say that's the language containment is



also true, A intersection B complement is a subset of A-B, how do we show this? Very simple take an X in A intersection B complement this means X belongs to A and X belongs to B complement, I'm going to be fast now because we have, this is not new for us we have solved a couple of problems already, implies X belongs to A and X belongs to B complement.



And now this implies that X belongs to A, and X does not belong to B, that's what your X belonging to B complement means, now this, observe this what does it say? X is in A but not in B, which means by definition X should be in A but not in B which means X belongs to A-B, correct, so the inclusion is now proven A intersection B complement subset of A-B, if you observe carefully you will realize that proofs of both the sides this way and that way of containment is more or less the same, correct and hence I have shown that A-B is indeed equal to A intersection B complement this is true in the Venn diagram as well, if you look at this diagram here A, in A you remove those parts of B and what is this equal to, it is actually equal to A intersecting with B complement look at this figure shaded figure outside B, and that time A only have this moon-like structure in common, correct, so A-B is A intersection B complement.



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