NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Set Theory

Union and intersections of sets – Part 3

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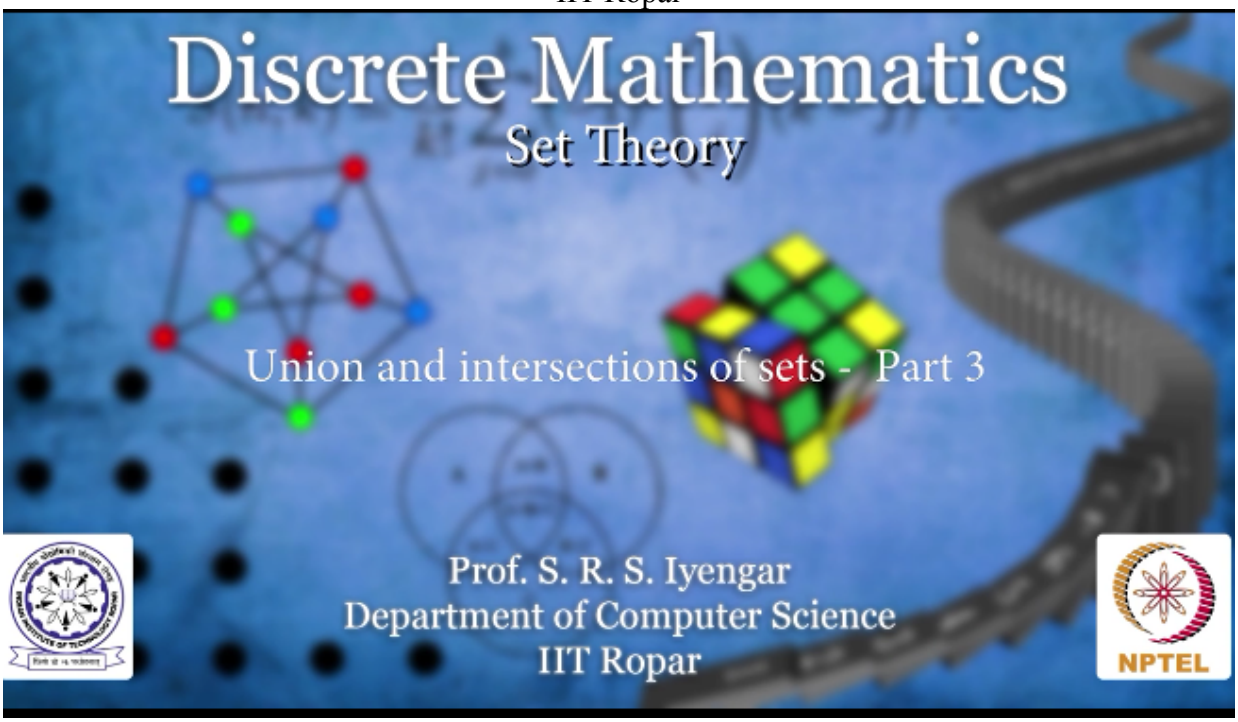
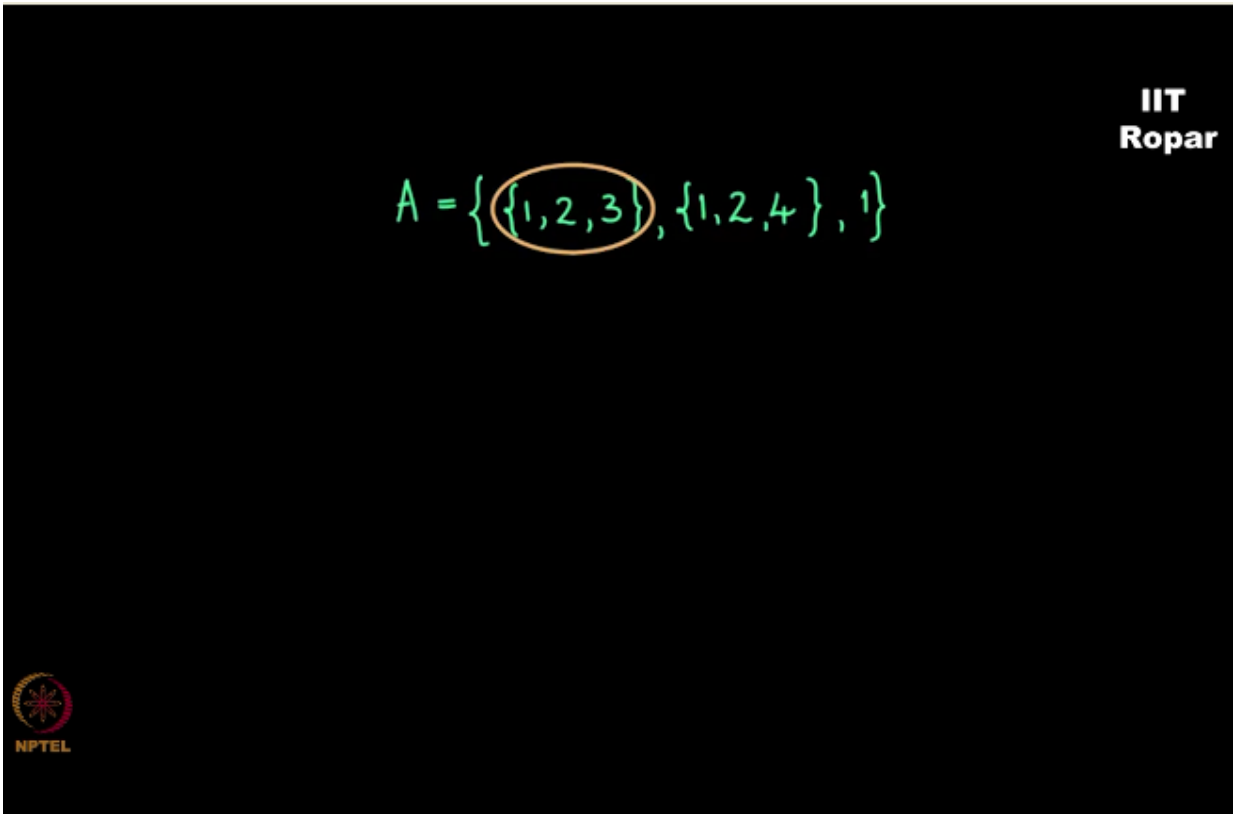
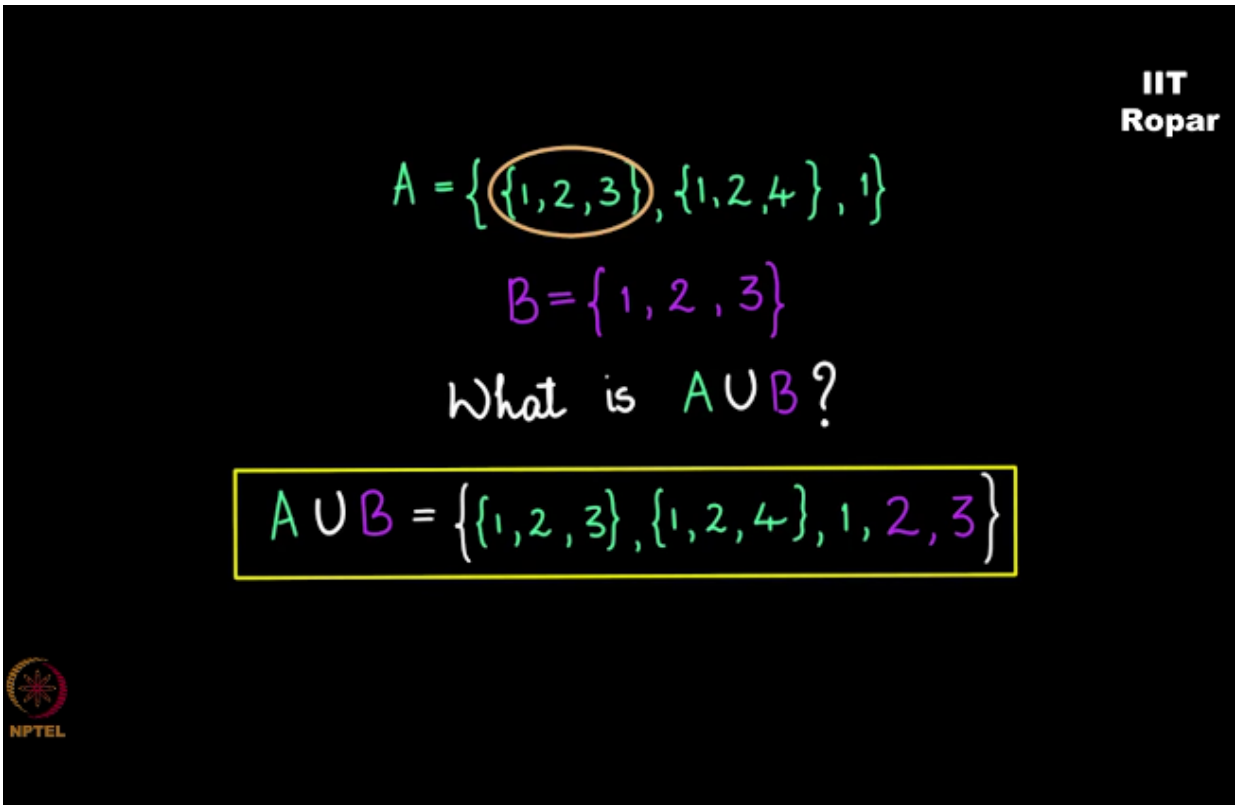


Let the set A, B, a set containing 1, 2, 3, a set containing 1, 2, 4, and an element 1, you see this set containing 1, 2, 3, is actually an element of A, note this.

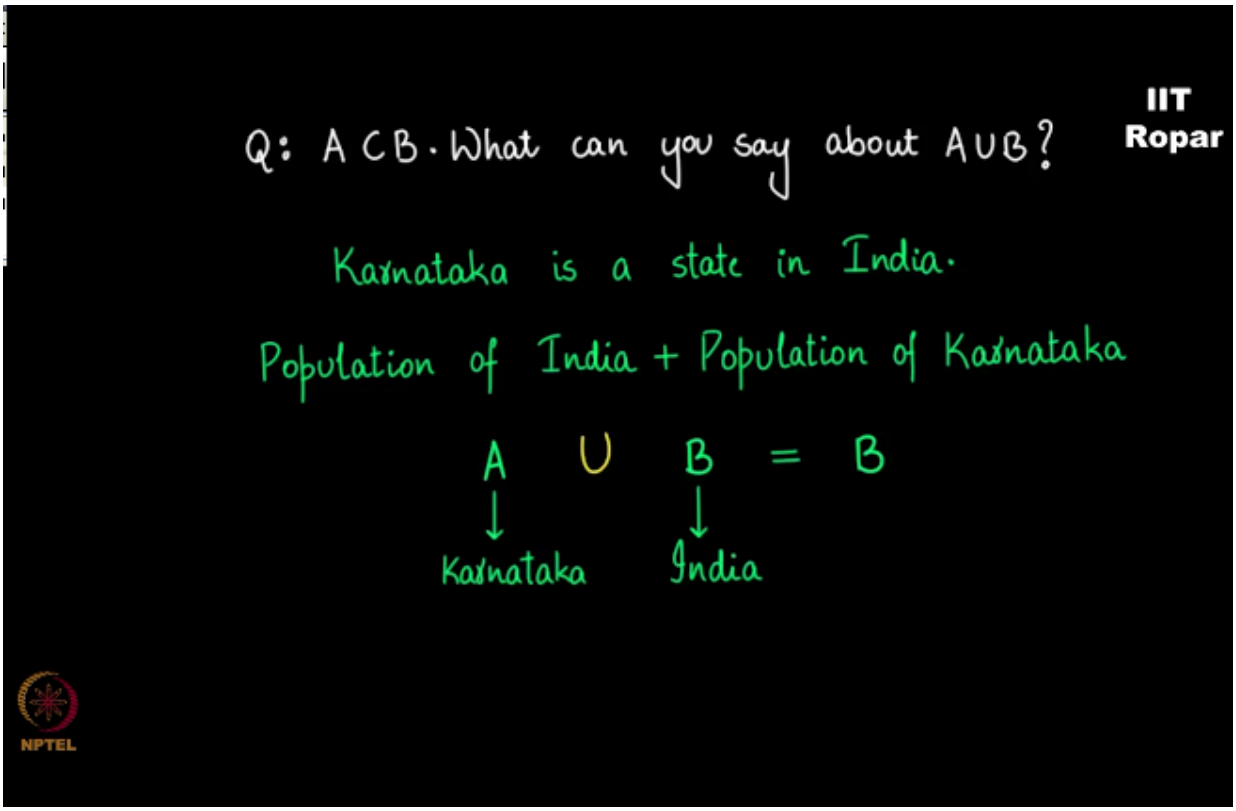


Let me now consider another set B which is 1, 2, 3, now if I quiz you what is A union B, what will be your answer? Pause and think for a moment, well A union B will be without any doubts every element of A will be here which is the set containing 1, 2, 3 is an element of A that will be here. Set containing 1, 2, 4 is an element of A that is here, element 1 is here, now B has elements 1, 2, 3, I take the union of A and B, so 1 is already here which means 2 will come here and 3 will come here, now this is the set A union B, do not get confused with the possibility that you write A union B as simply the set containing 1, 2, 3, and the set containing 1, 2, 4, and

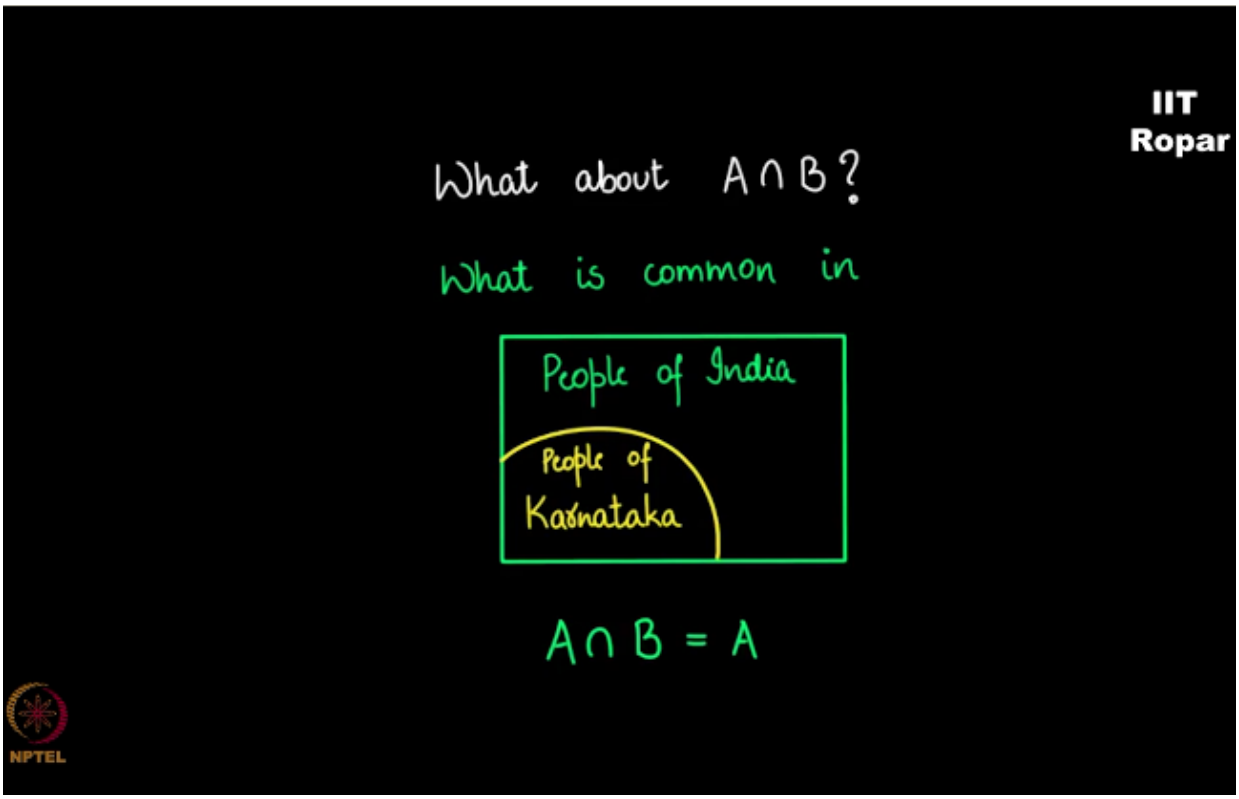


the element 1, and say that the set containing 1, 2, 3 is already here so I'll not include anything from B, no it doesn't work that way, the definition of union is this and we need to note that whenever there is a set within a set it is considered as an element, right, the answer is this.

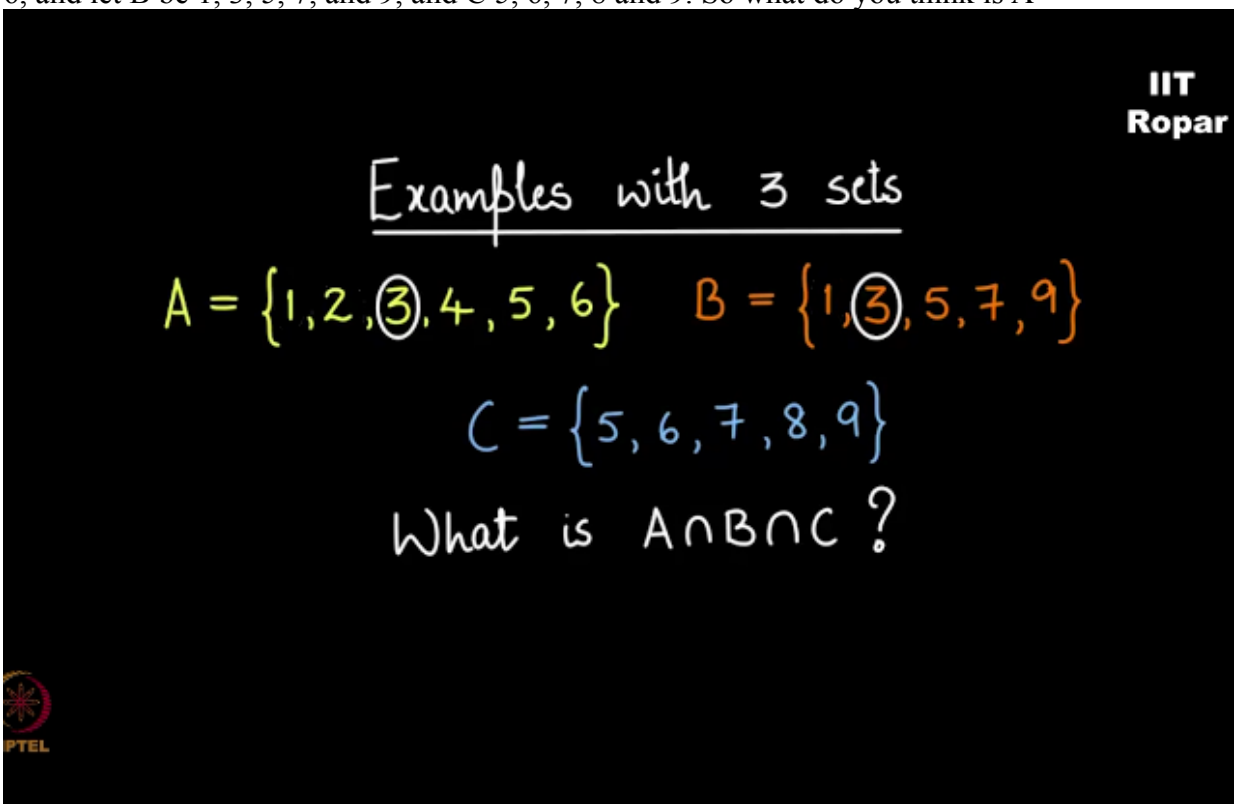
Look at this question A is a subset of B what can you say about A union B? Now this is like saying, in India you have the state called Karnataka, right, if you take all, the entire population of India and then add in to the population of India, the population of Karnataka what will you get as a result? Now don't you think this is a very silly question to even ask, right, so this is the question that is being asked here, in real life the question sounds very silly, but set theoretically speaking whenever a set is subset of the other set it's union will simply be the bigger set, so A here is equivalent to Karnataka, B here is equivalent to India, so A union B will indeed be equal to B, right.



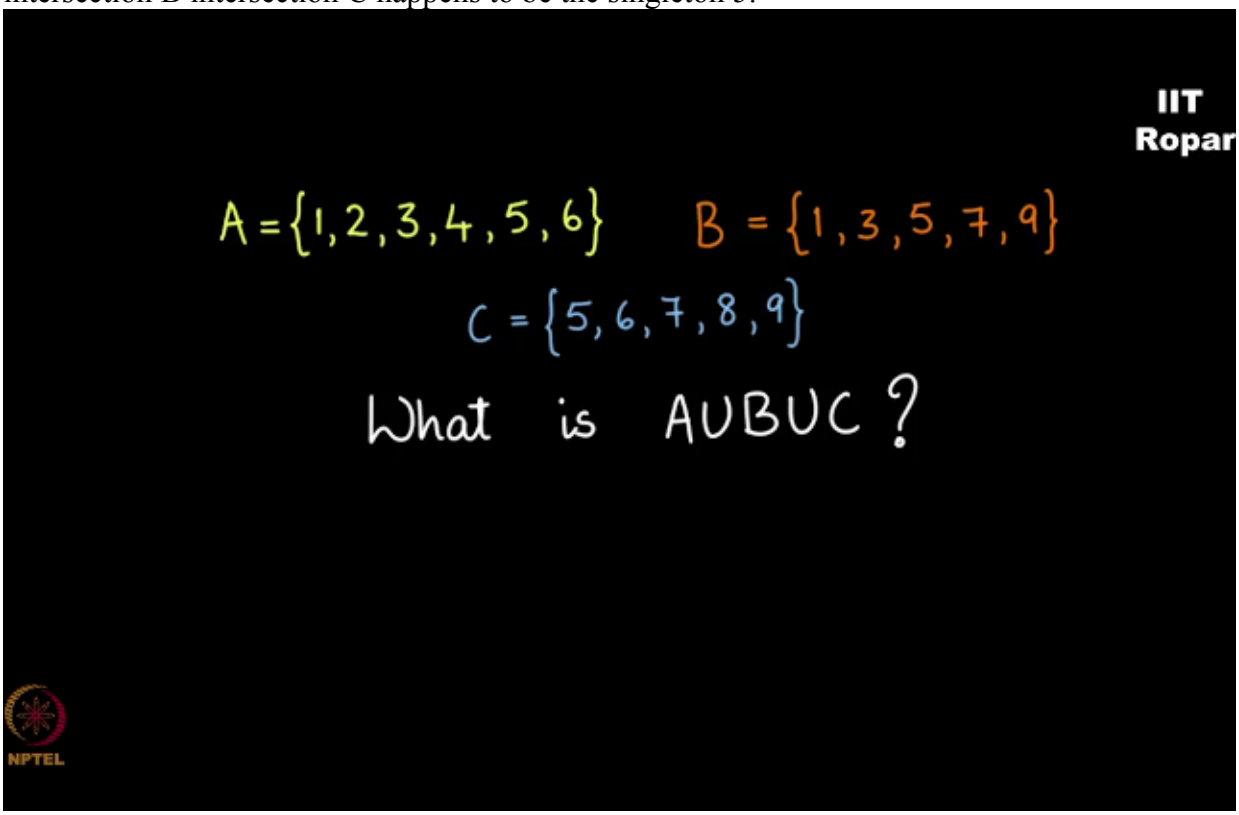
Now what will be A intersection B? What is common between India, people of India and people of Karnataka? It'll be people of Karnataka, right, so A intersection B will be equal to A, so union will give you one set, intersection will give you the other set, note this carefully, think about it, look at the question and look at the answer. Let us look at the problem with three sets.



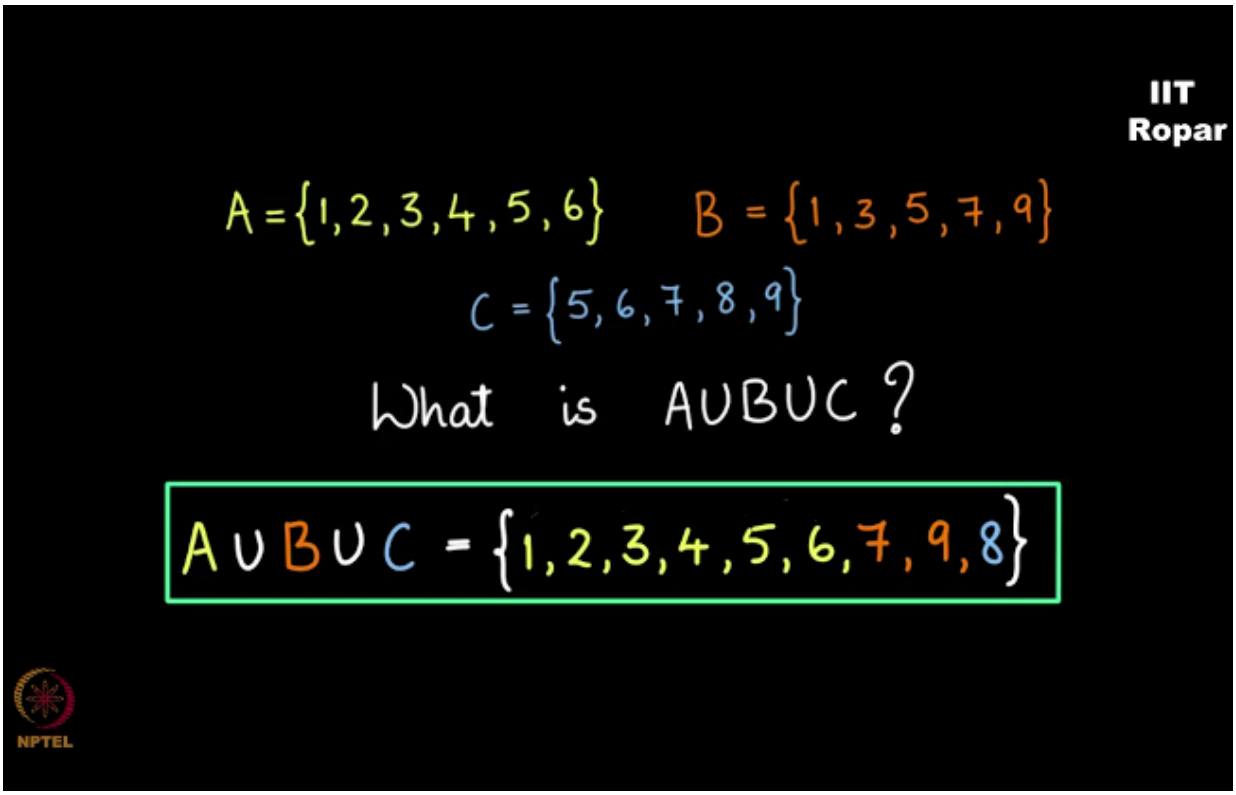
The story of union and intersection can actually be extended to not just two sets but as many sets as you want. So let's look at the example which involves three sets, let A be 1, 2, 3, 4, 5 and 6, and let B be 1, 3, 5, 7, and 9, and C 5, 6, 7, 8 and 9. So what do you think is A



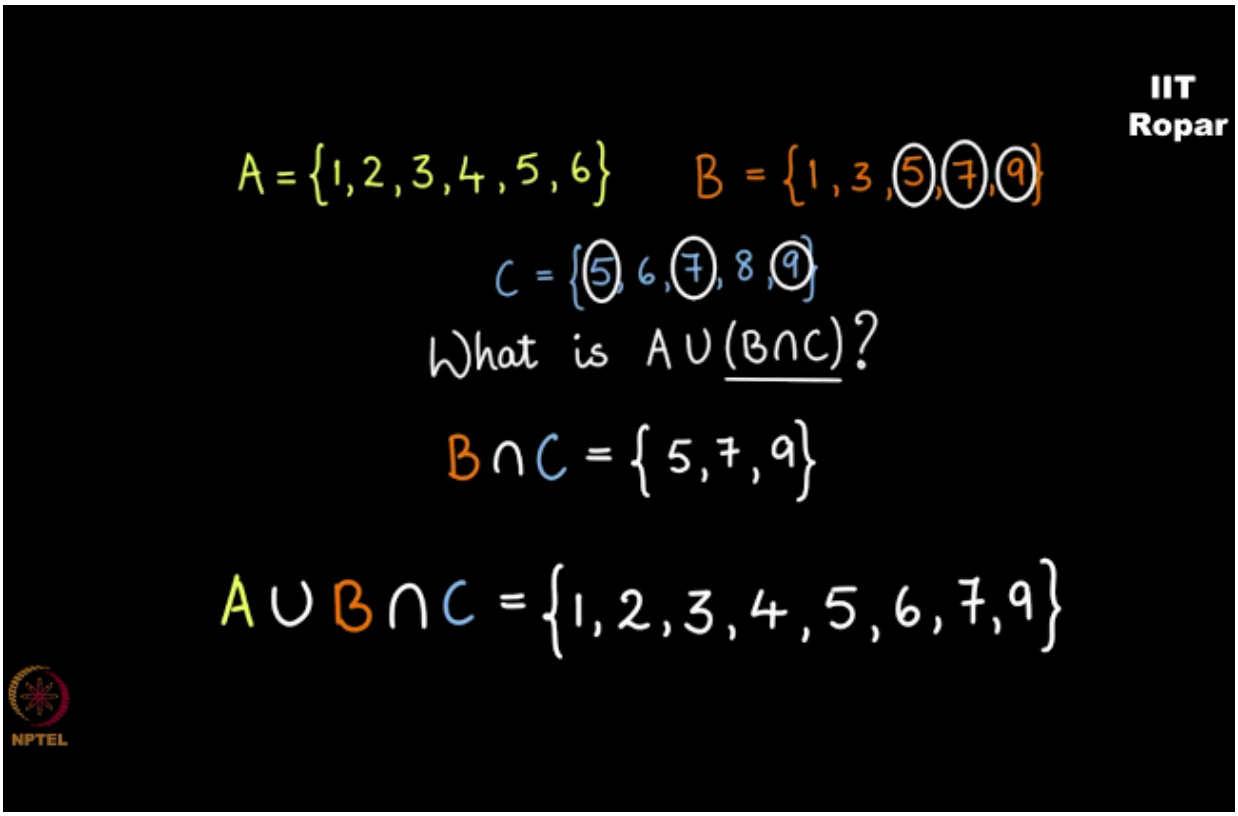
intersection B intersection C, by this we mean what is, what are those elements common in all three sets, a little bit of understanding tells you, observation tells you that 1 is in A, 1 is in B but not in C, 2 is in A and not anywhere else, 3 again is in A and B, but not in C, if you observe closely the only thing that is there everywhere is the number 5 and nothing else, so A intersection B intersection C happens to be the singleton 5.



Next question, what do you think is A union B union C? Simply write down all that is visible in A, B and C, not worrying about repetition, so it will be 1, 2, 3, 4, 5, 6, all elements of A comes here, and then 1 is already done, so I'll not repeat it, 3 is done, 5 is done, 7 is new, I'll put 7 here, 9 is new I'll put 9 here, and then coming to C, 5 is there, 6 is there already, 7 is there, 8 is there, no, no 8 is not here, so I'll put 8 here, so my A union B union C will be 1, 2, 3, 4, 5, 6, 7, 8, and 9.



Let us now look at a slightly more complicated question, what is A union B intersection C? So whenever you encounter something like this you must first try to find out B intersection C inside the bracket, C it has one set and take its union with A, so what is B intersection C? B and C simply has 3 elements in common, 1 being 5, and then 7 is in common so let me write down 7 and then 9 is in common I'll write down 9, so B intersection C is 5, 7, 9 and its union with A happens to be 1, 2, 3, 4, 5 gets repeated so only once I write 5, 6 is in A, I write 6, 7 and 9 this is my answer.



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