NPTEL

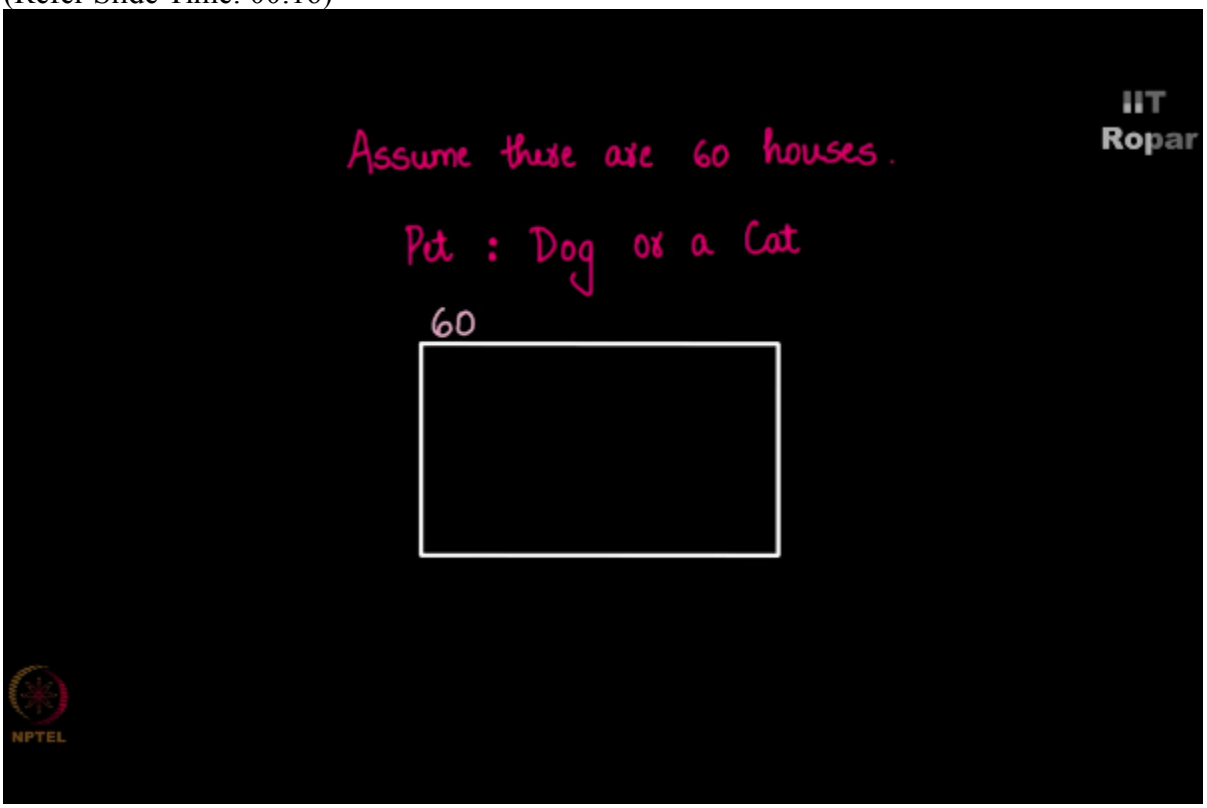
NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Principle of Inclusion and Exclusion

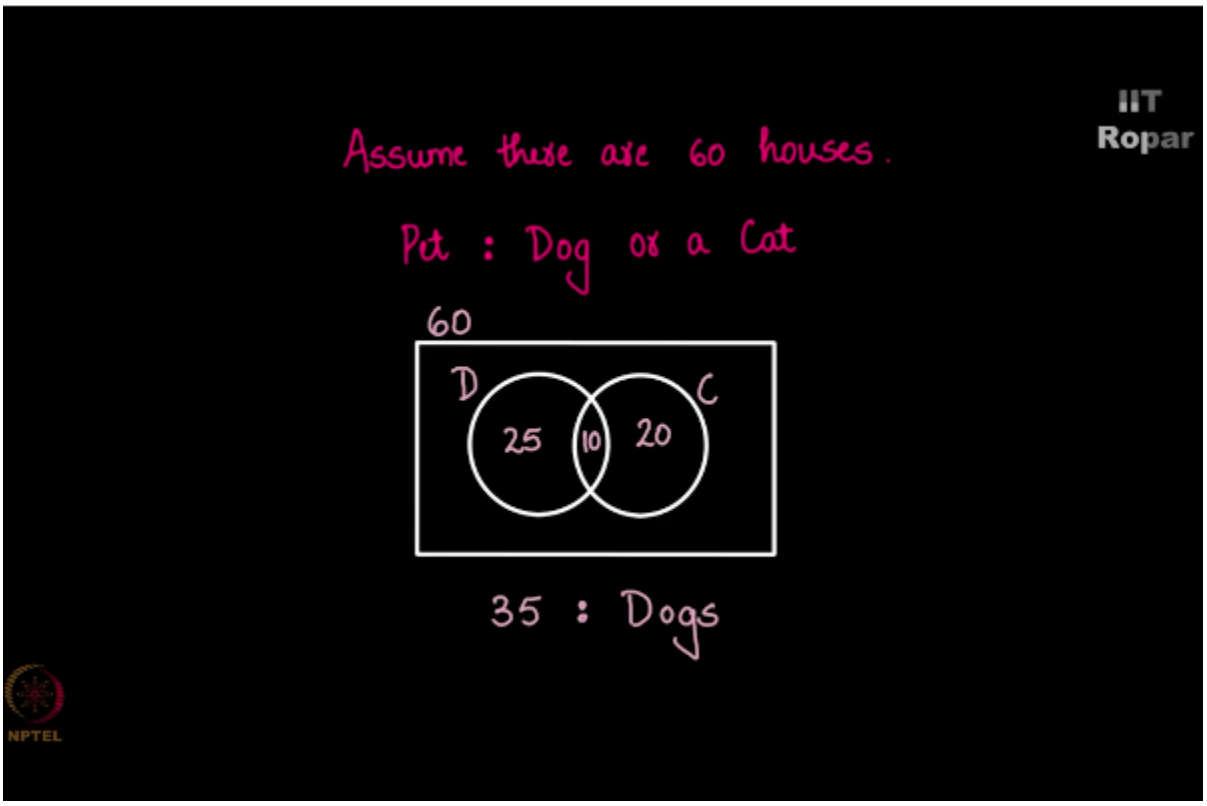
Example 1 - Dogs and Cats

By
Prof. S.R.S Iyengar
Department of Computer Science
IIT Ropar

Assume there are 60 houses in a small town, and most of them have a pet in their house, either they have a dog or a cat, look at these numbers here,
(Refer Slide Time: 00:16)

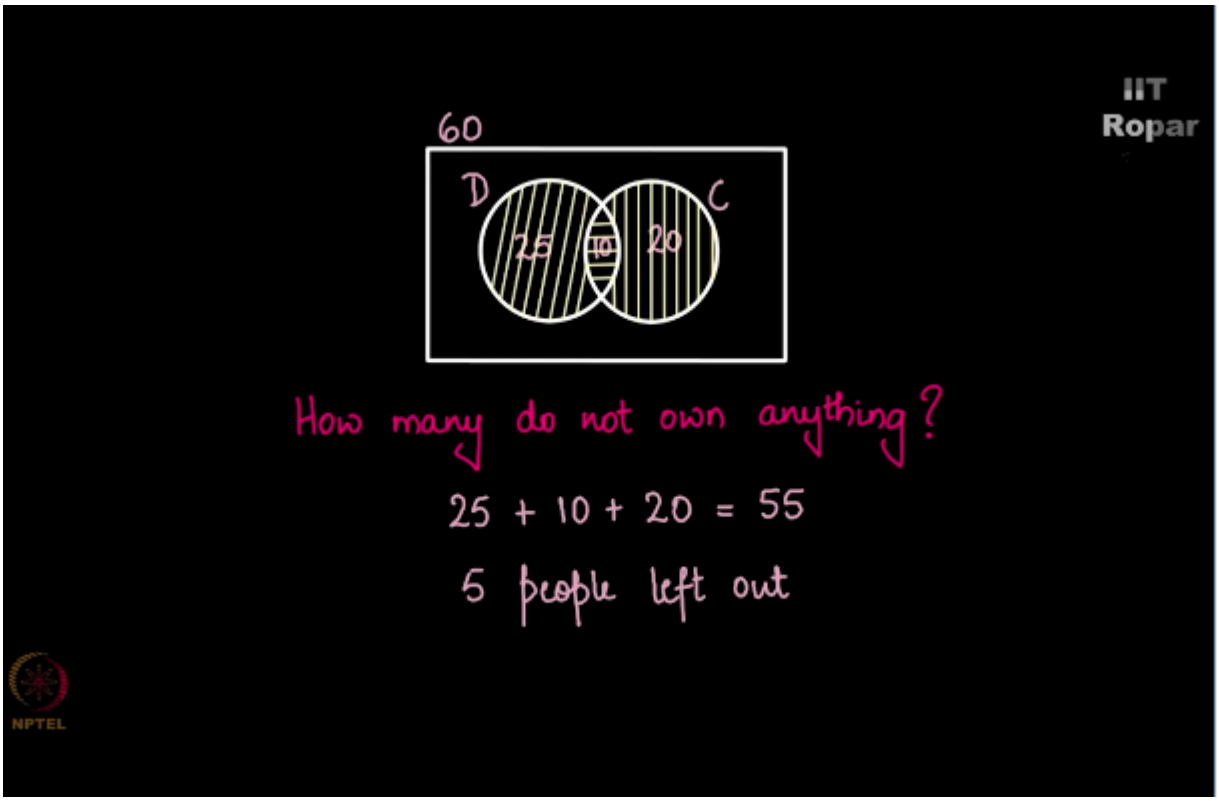


25 people, let's say there are 60 people all put together out of which 25 of them have dogs only, 20 of them have cats only, and 10 people have both a dog and a cat, now you see what's happening here, 35 people claim they are owners of dogs 35,
(Refer Slide Time: 00:44)



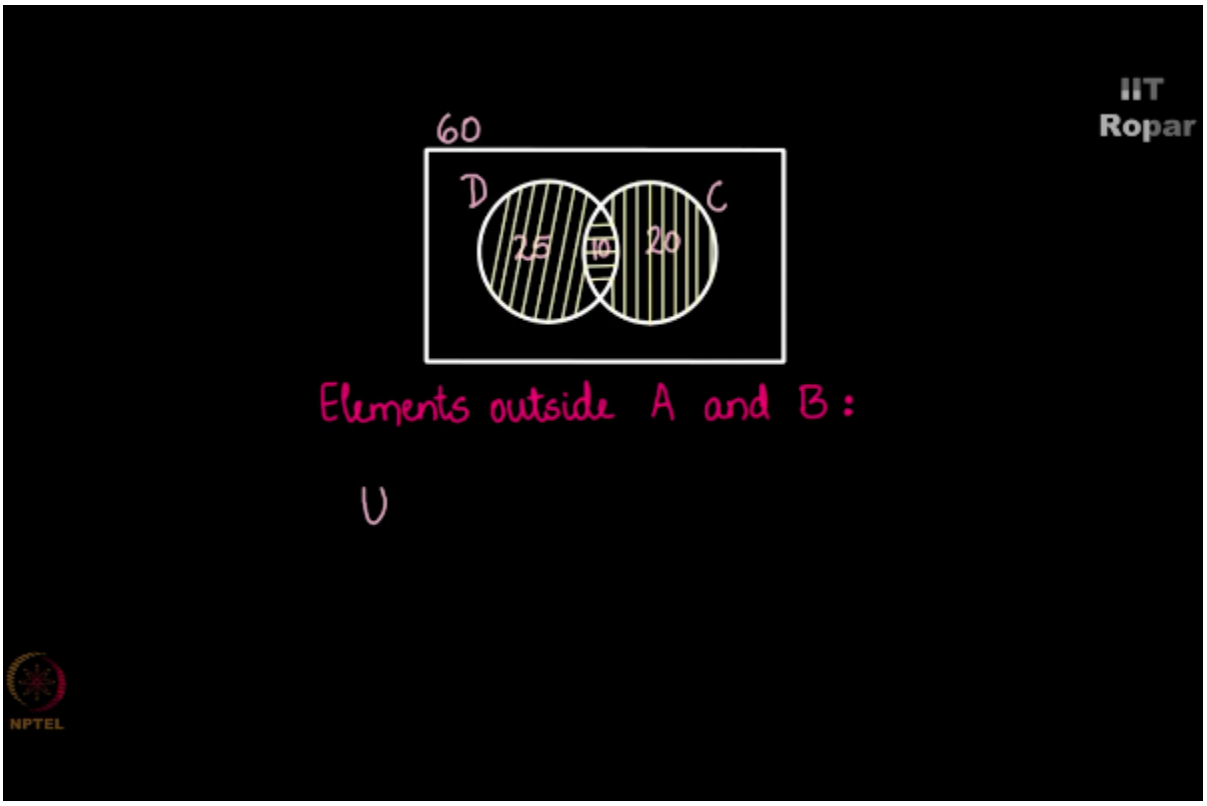
you see because 25 dogs only and 10 people own a dog as well as a cat, right, so 20 people own a cat and 20 + 10, 30 people own a cat as well as a dog, so 30 people own cats, 35 people own dogs out of which 25 old dogs only, 20 own cats only, and 10 people on both dog and a cat, now you see how many people do not own anything, there are 60 people put together in the town, and 25 + 10 + 20 happens to be 55, but there are 60 people which means there are 5 people left out,

(Refer Slide Time: 01:25)



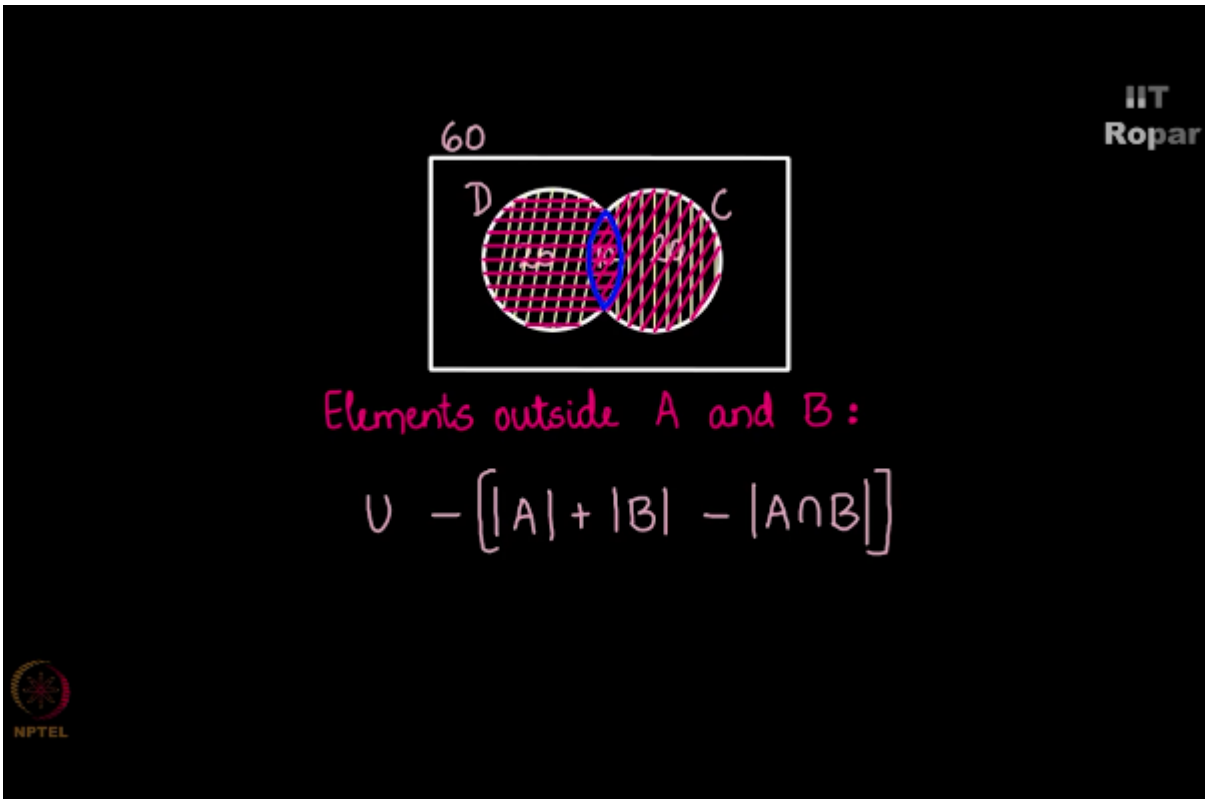
so then in general you are given a situation like this where you have a set A and you have a set B, and you have something in the intersection as well A intersection B, and there are some elements outside A and B as well, okay, that is called the universal set U.

(Refer Slide Time: 01:47)



Now how do you compute what is outside A and B? What you do is you first compute what is in the total number of elements inside U, and then subtract it from the elements in A union B for that you may want to know what is the formula for A union B which happens to be number of elements in A + number of elements in B, but then as you can see you over count this part so you must subtract A intersection B from this as explained already,

(Refer Slide Time: 02:20)



correct, so this would be the formula for you to compute the number of people outside the set A and B.

Now why would anyone care about something outside the set A and B, let us see some examples where it is actually important for us to count the number of elements outside the set given sets.