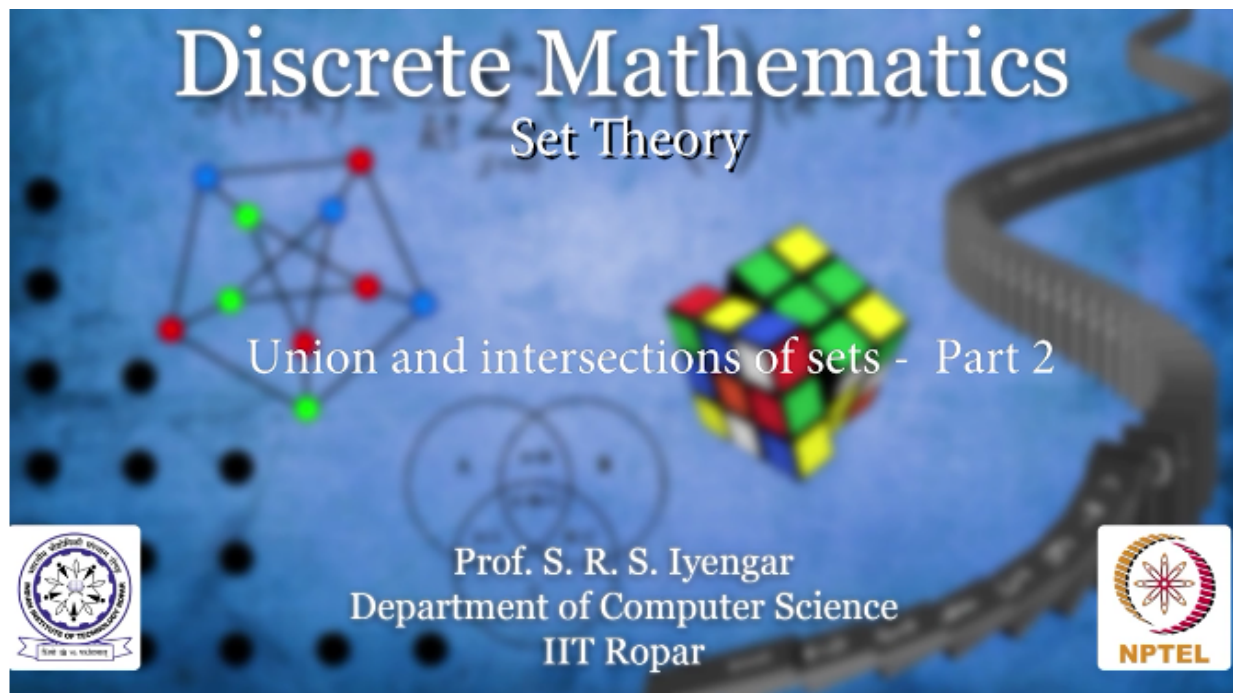NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Set Theory

Union and intersections of sets – Part 2

With
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Nita needs to shop for sweets to gift her loved ones on the occasion of Diwali. She decides on

giving assorted sweets as festival gift, she goes to a shop nearby and buys two different packets

of assorted sweets, the first packet has 5 pieces of sweets and there are all of different types, the

second packet has 8 pieces of sweets and all of them again are of different types, what do you think is the union of the first packet and the second packet? Yes, it is 11 as you can see.

5 Sweets ∪ 8 Sweets = 11 Sweets

Now what do you think about the intersection of these two sweet packets? Yes, it's going to be 2 as you can see, so as is evident already union simply stands for all possible unique items in the 2 sets put together and intersection gives us the total number of unique items that are common in both the sets, consider the set of all natural numbers, N = 1, 2, 3, 4, and so on up to infinity, right.

Now let me consider the following 2 sets A, which is equal to set of all even numbers, 2, 4, 6, 8 and so on, and set B is equal to set of all odd numbers 1, 3, 5, 7, and so on. So what do you

Natural numbers :

$$N = \{1, 2, 3, 4, \ldots\ldots\}$$

$$A = \{2, 4, 6, 8, \ldots\ldots\}$$

$$B = \{1, 3, 5, 7, \ldots\ldots\}$$

What is $A \cap B$?

think is A intersection B? Do you see that no even number is odd, and no odd number is even and hence there cannot be an element that can belong to both A as well as B, and so A
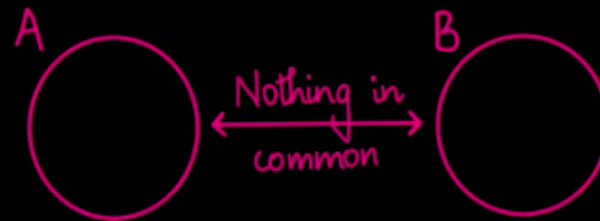
$$A = \{2, 4, 6, 8, \dots\dots\}$$

$$\underbrace{\qquad\qquad}_{\text{Not odd}}$$

$$B = \{1, 3, 5, 7, \dots\dots\}$$

$$\underbrace{\qquad\qquad}_{\text{Not even}}$$

No element in common.

intersection B is an empty set, whenever two sets are such that they do not have any elements in common, in other words whenever two sets intersection is empty we call such sets as disjoints, note we'll be using this word very often from now on.

A   B

Nothing in
common

$A \cap B = \{ \}$

Disjoint Sets

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Okay, going ahead what is A union B, it's very easy to see that A union B is indeed the whole of the natural numbers, namely 1, 2, 3, 4, 5, and so on, why? That's because a number is either even or odd, so every natural number appears either in A or in B, and hence A union B should be the whole of M.

$$A = \{2, 4, 6, 8, \ldots\} \cup B = \{1, 3, 5, 7, \ldots\}$$

$$A \cup B = N = \{1, 2, 3, 4, 5, \ldots\}$$

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