NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Graph Theory – 3 &
Generating Functions

Picking 7 balls – The naive way

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

Before moving ahead let us solve this question, assume there is a big basket containing several blue, green, and red balls, there are several of them, now the question is in how many ways can we pick 7 balls of red, blue, and green color out of this big basket?
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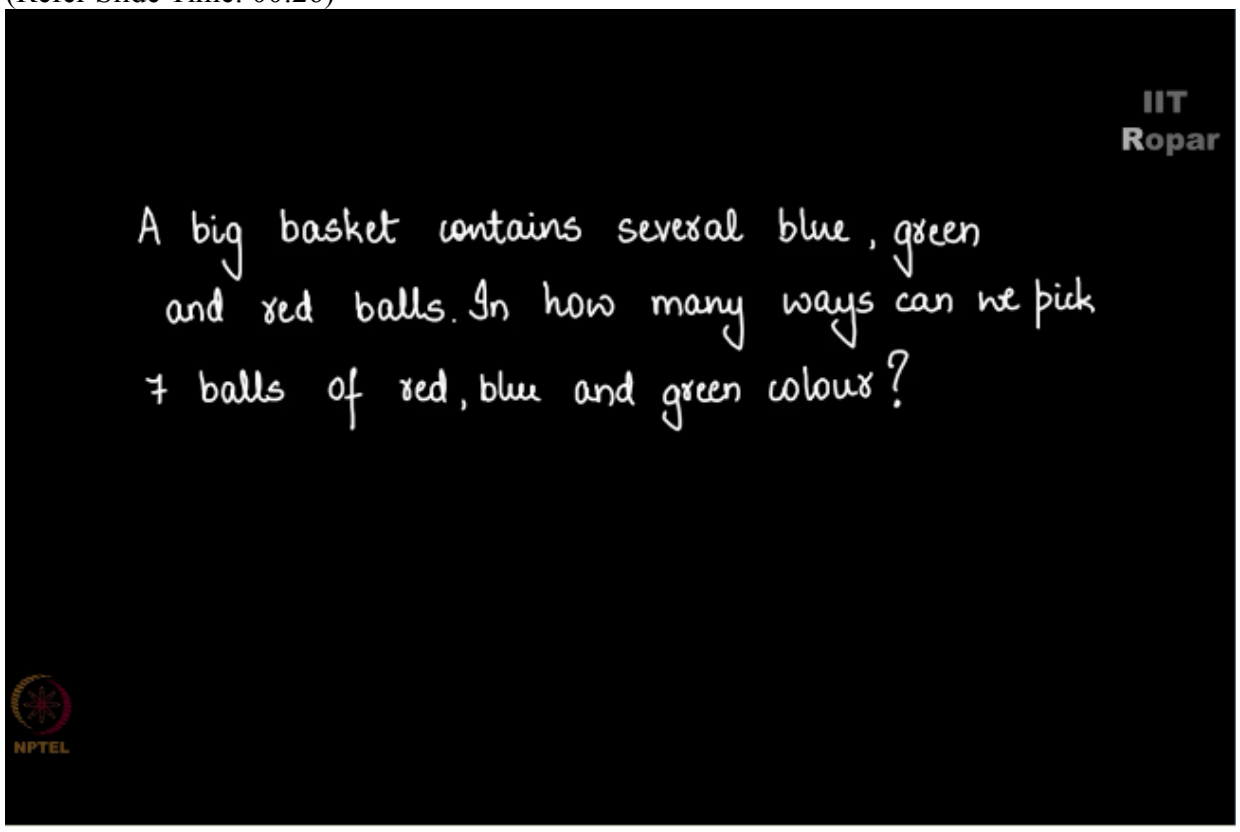

Now there is no constraint given here you see, you can also pick 0 balls of some color, now if you remember the sticks and the containers problem which we solved in the week 1, the ice-cream vendor problem if you remember that this is on the same lines as that, you might want to recall that for help, now I write 7 balls like this,
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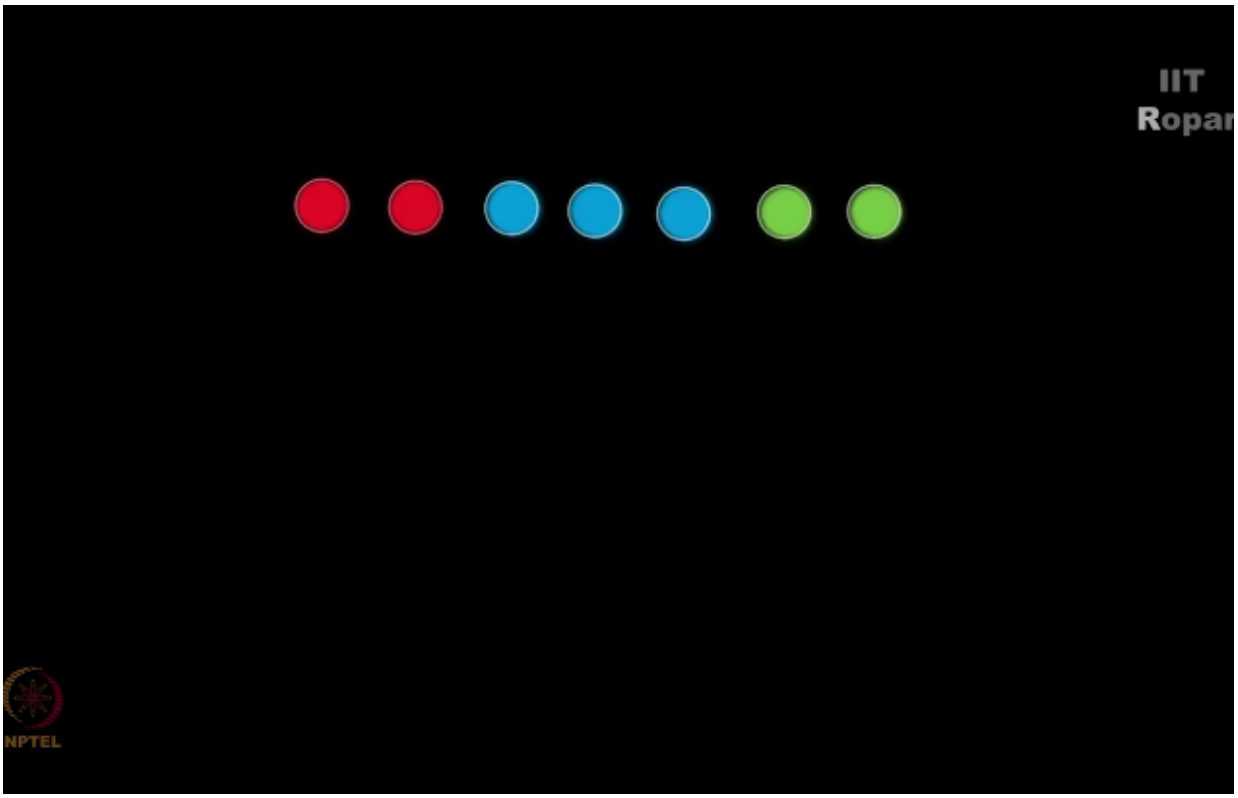

now I'm going to place 2 sticks in between the balls to differentiate the colors,
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so if I place the sticks like this it means I have picked 2 red, 3 blue and 2 green balls, if I place the two sticks like this

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it means I have picked 0 red, 6 blue, and 1 green ball, if I place them like this,

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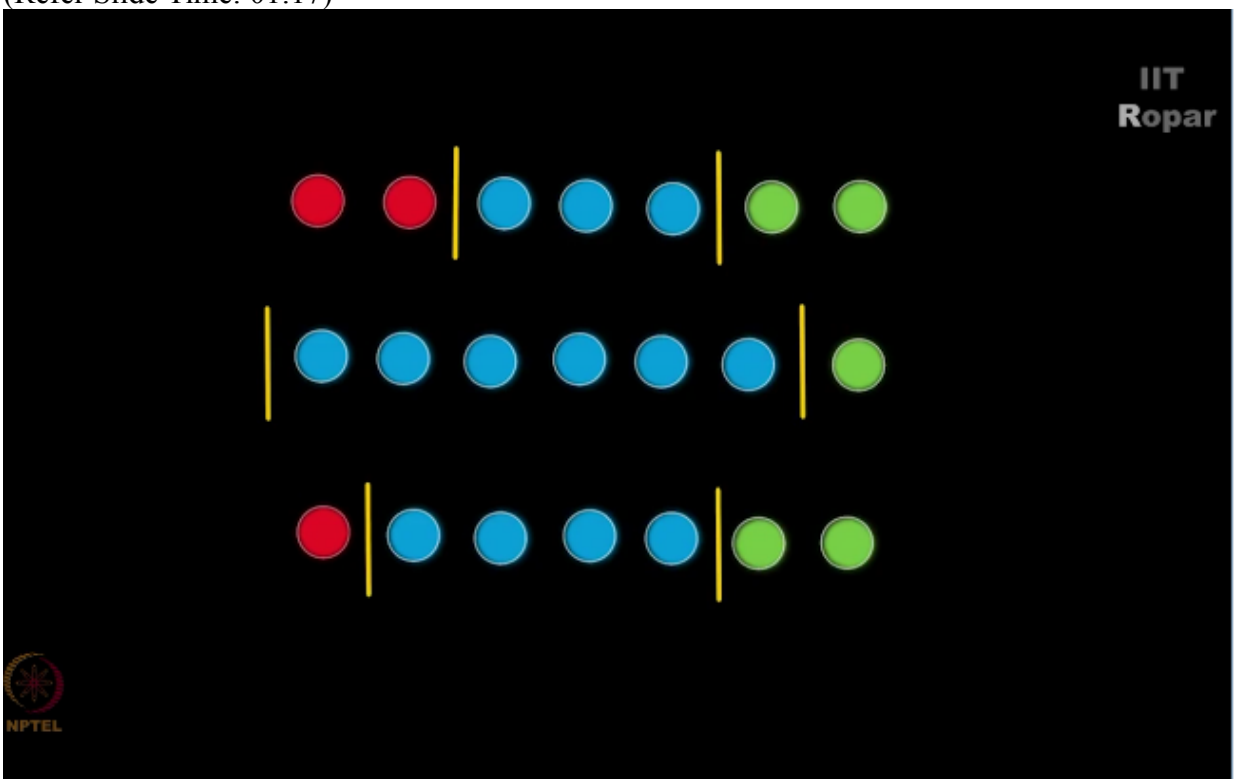

it means I have picked 1 red, 4 blue, and 2 green, did you see that I can also pick 0 balls, right? It's also valid, I can pick even 7 balls of the same color that is also valid. I can go on enumerating like this, there are several possibilities but we have a nice streak to solve this question if you remember, it falls under combinations with reputations, so how do we analyze this? You see there are 3 colors here, red, blue and green, and I've to pick 7 balls of these colors,

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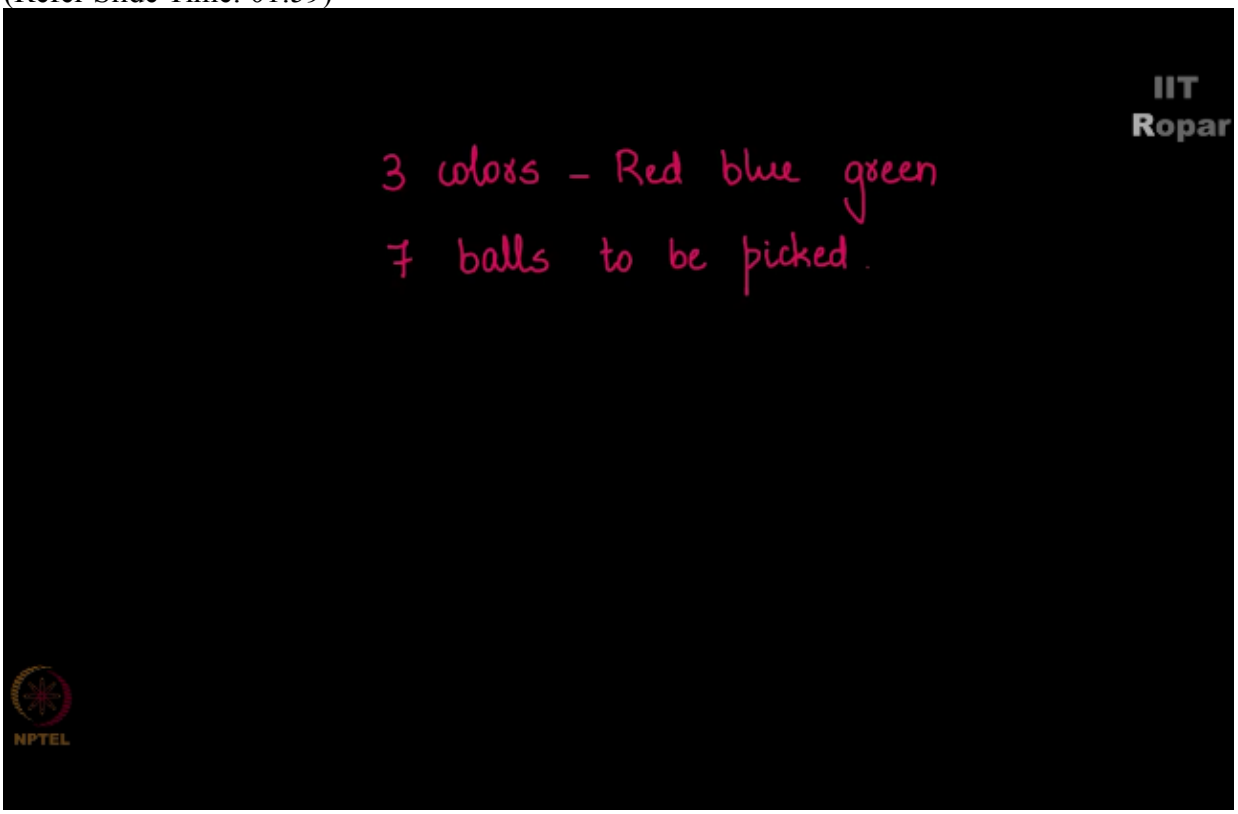

before solving it using the formula let me give you another method too, I have this color 1, color 2, and color 3, let me write it as C1, C2, and C3, don't you see that C1 + C2 + C3 should be equal to 7,

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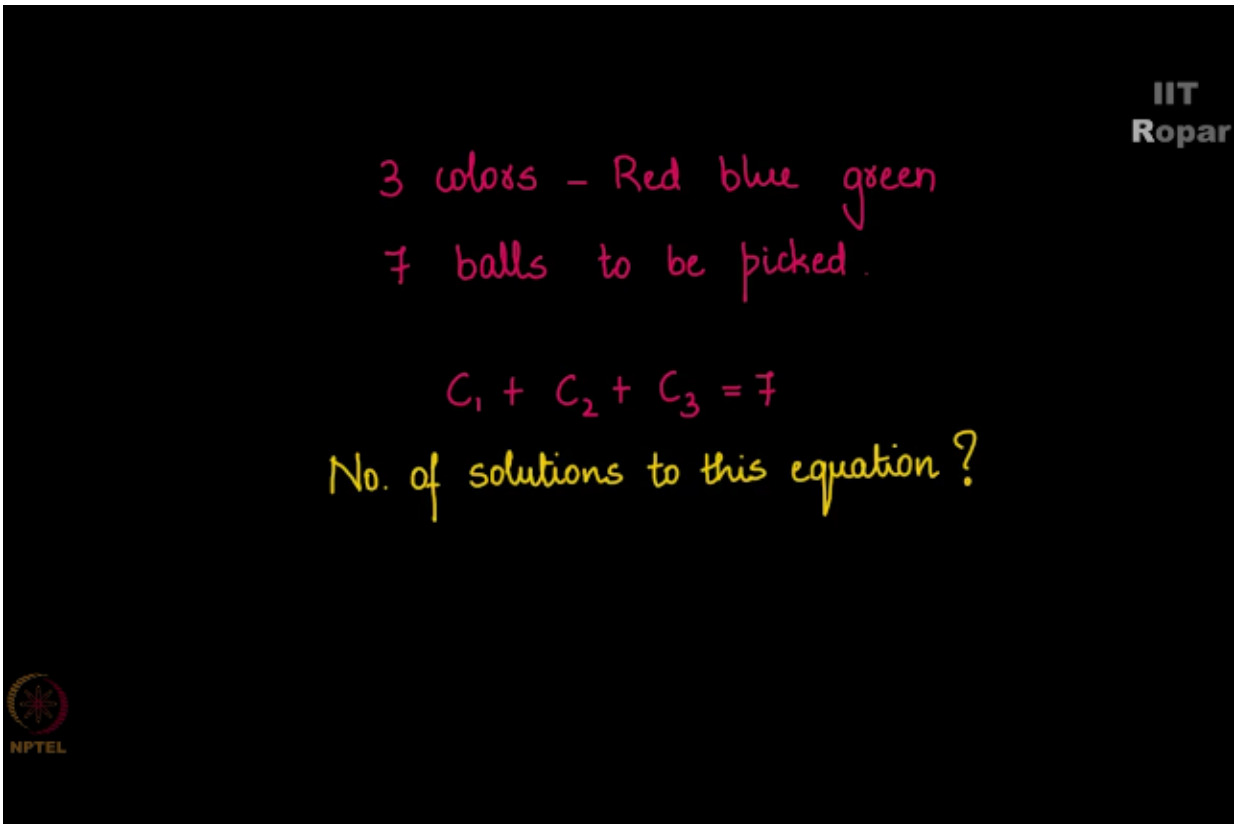

and the number of solutions for this equation C1 + C2 + C3 = 7 is precisely what I'm asking for. I hope you have seen such questions in week 1.

Now it is the same thing what we are asking here as to how many ways can we pick 7 balls of the 3 colors, so if N is 3 and R is 7, from the formula N + R – 1 choose R it follows that 3 + 7 – 1 choose 7 = 9 choose 7, which is 9x8/2, I actually got this from 9 factorial/7 factorial into 2 factorial and on solving this it gives me the answer 36, so in 36 ways we can pick 7 balls of red, blue, green color from the big basket.

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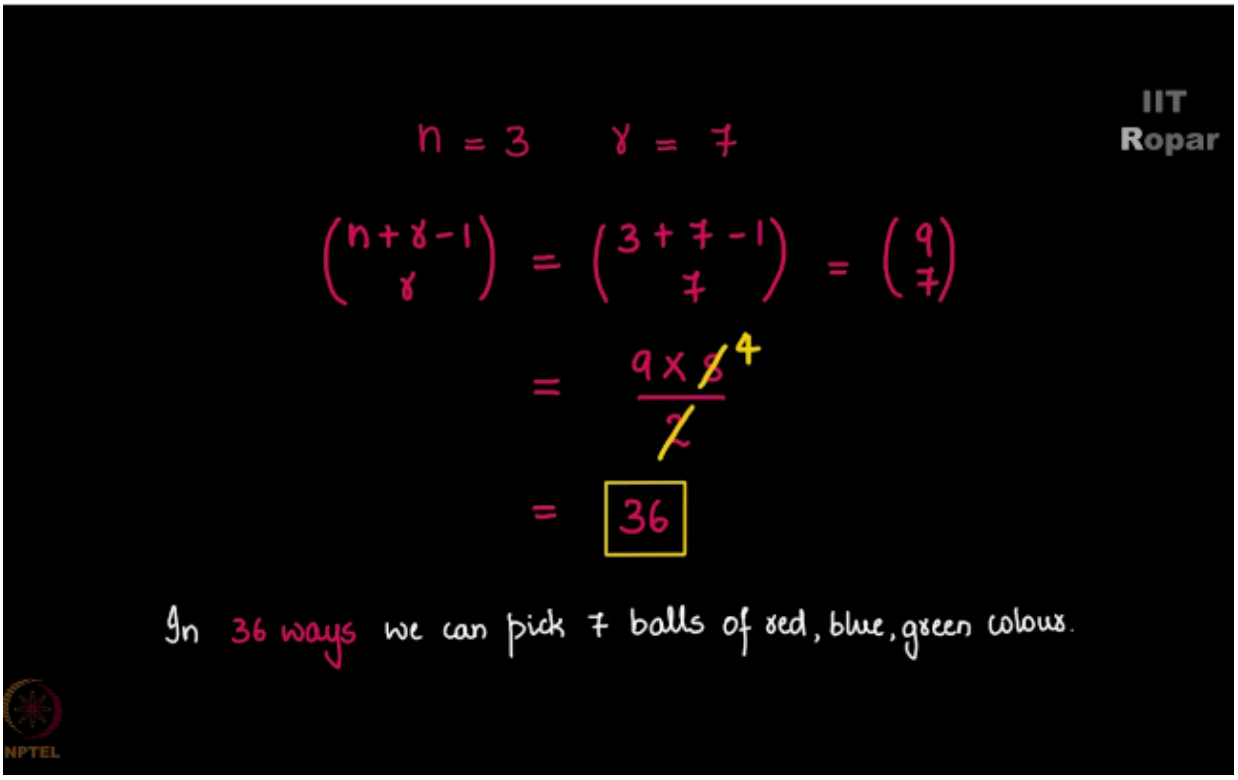

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