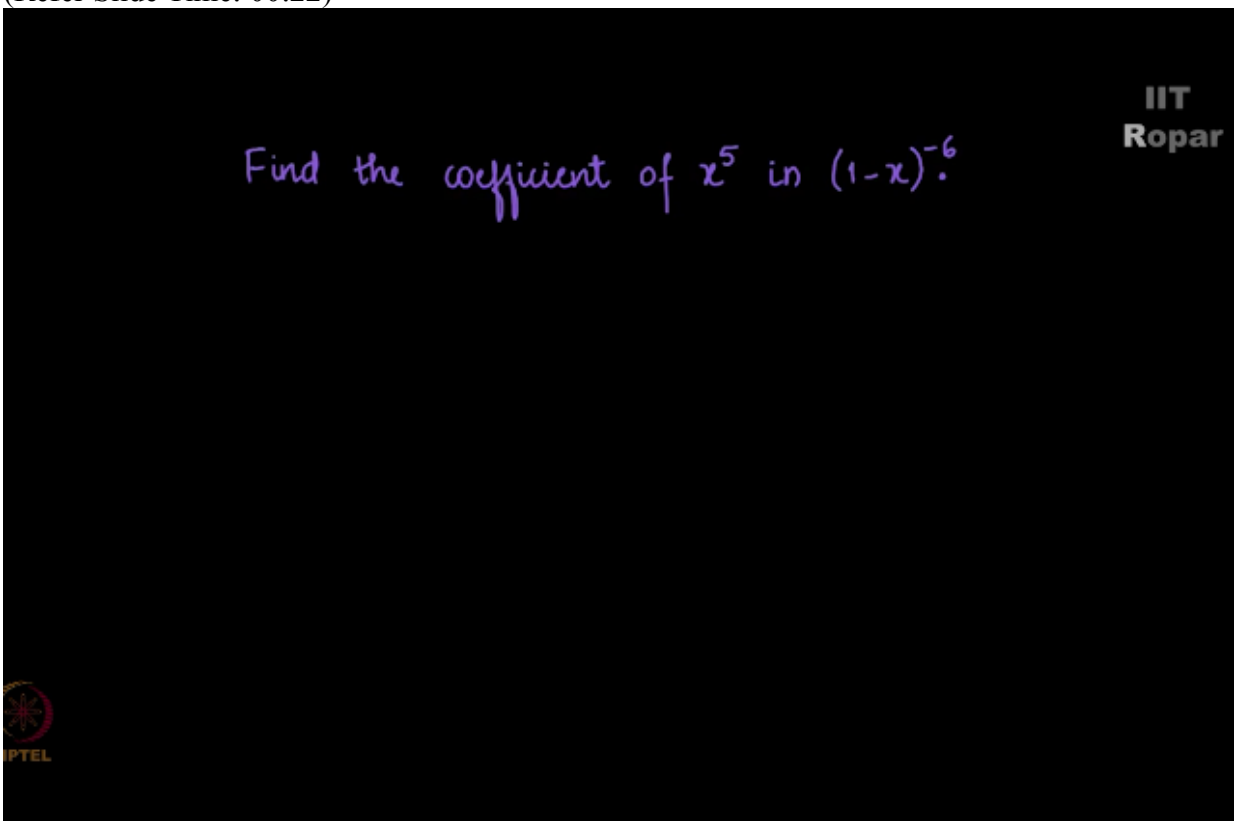
NPTEL

NPTEL ONLINE CERTIFICATION COURSE

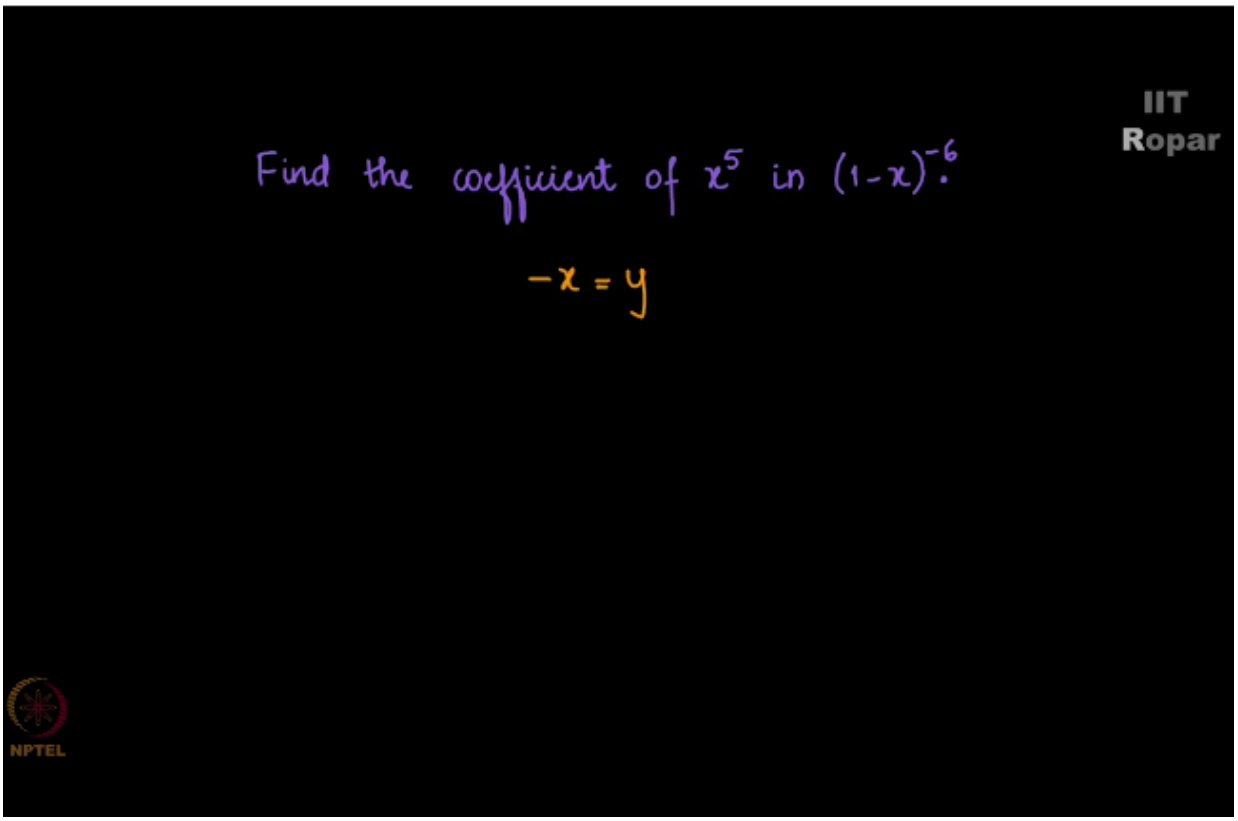
Discrete Mathematics
Graph Theory – 3 &
Generating Functions

Generating functions - Problem 1
By
Prof. S.R.S Iyengar
Department of Computer Science
IIT Ropar

The professor just taught the expansion of 1 + X whole to the –N, we are going to see that in action now, the first question goes like this, find the coefficient of X to the 4 in the expansion of 1 – X whole to the -6,
(Refer Slide Time: 00:22)

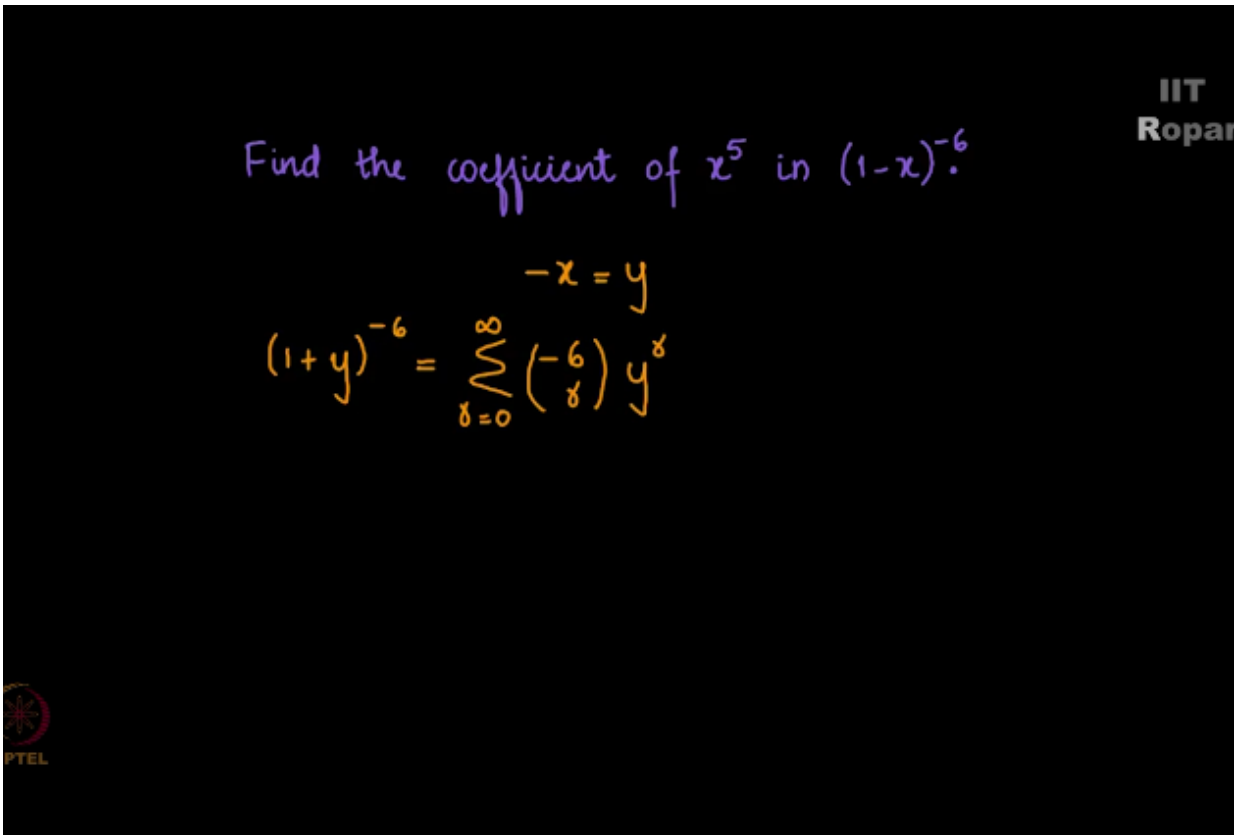


well, we have learnt how to expand 1 + X whole to the –N, but here we are have 1-X whole to the –X, so how do we go about? Very simple, substitute in place of –X another variable Y, so the question now becomes 1+Y whole to the -6,
(Refer Slide Time: 00:45)



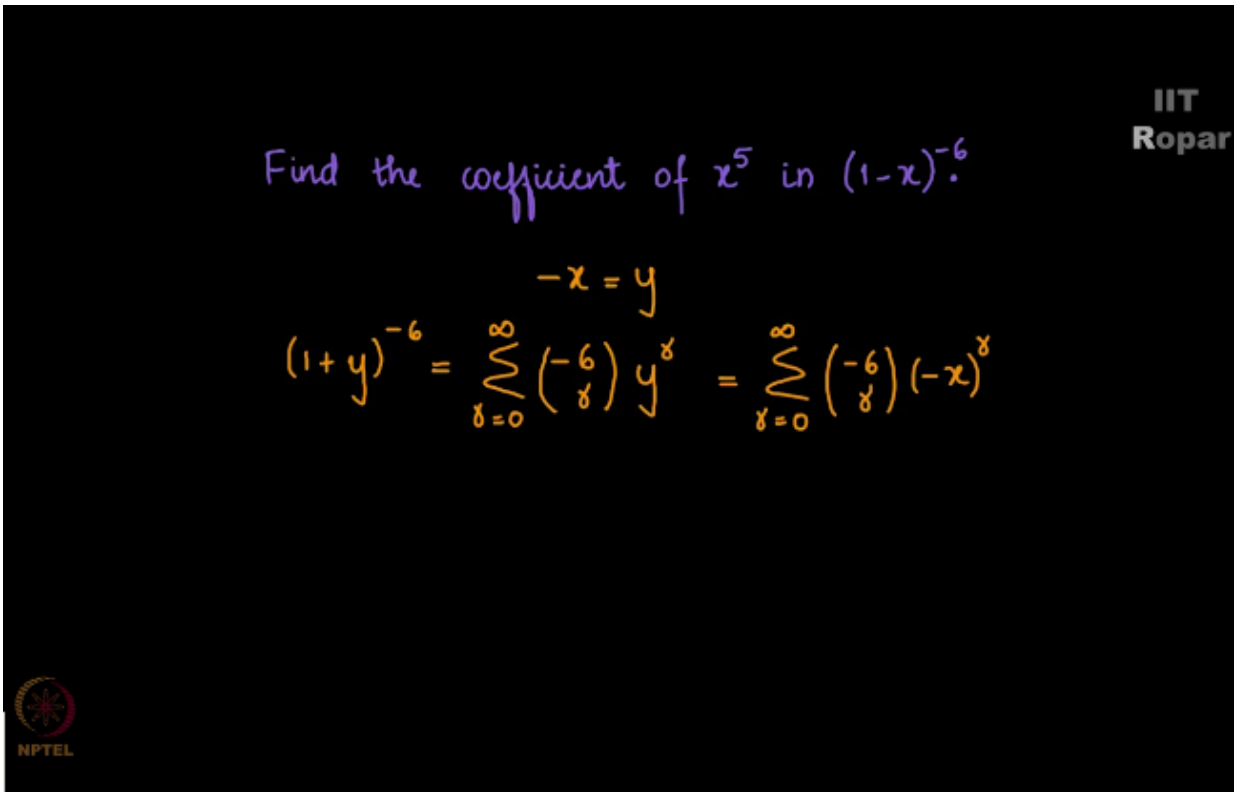
you have to find the coefficient of X to the 4, right, so we'll first expand 1+Y whole to the -6 and we will proceed further. So the expansion of this goes like this summation are from 0 to infinity -6 choose R into Y to the R,

(Refer Slide Time: 01:09)



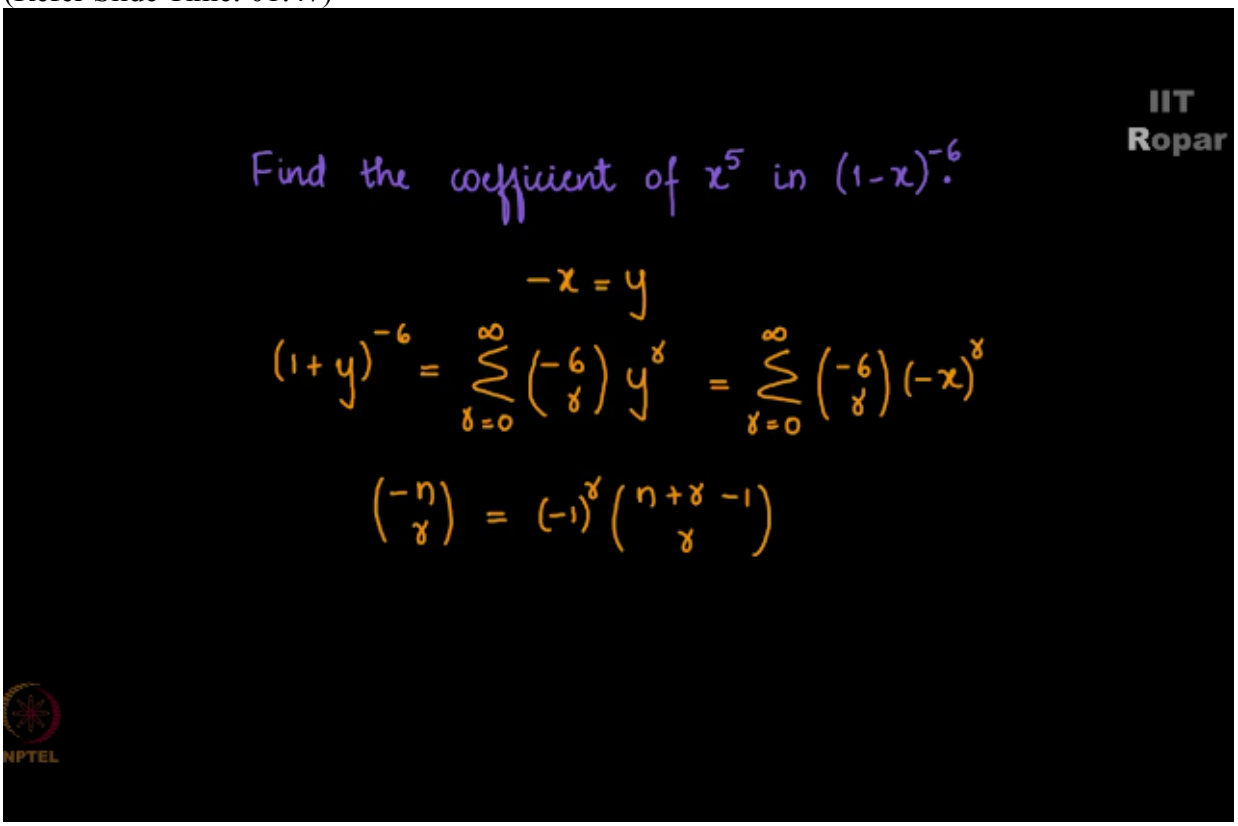
I hope this step is clear, if not you can refer to the formula which is stated in the previous video, this is nothing but summation R from 0 to infinity – 6 choose R into –X whole to the R, in place of Y I have substituted –X.

(Refer Slide Time: 01:29)

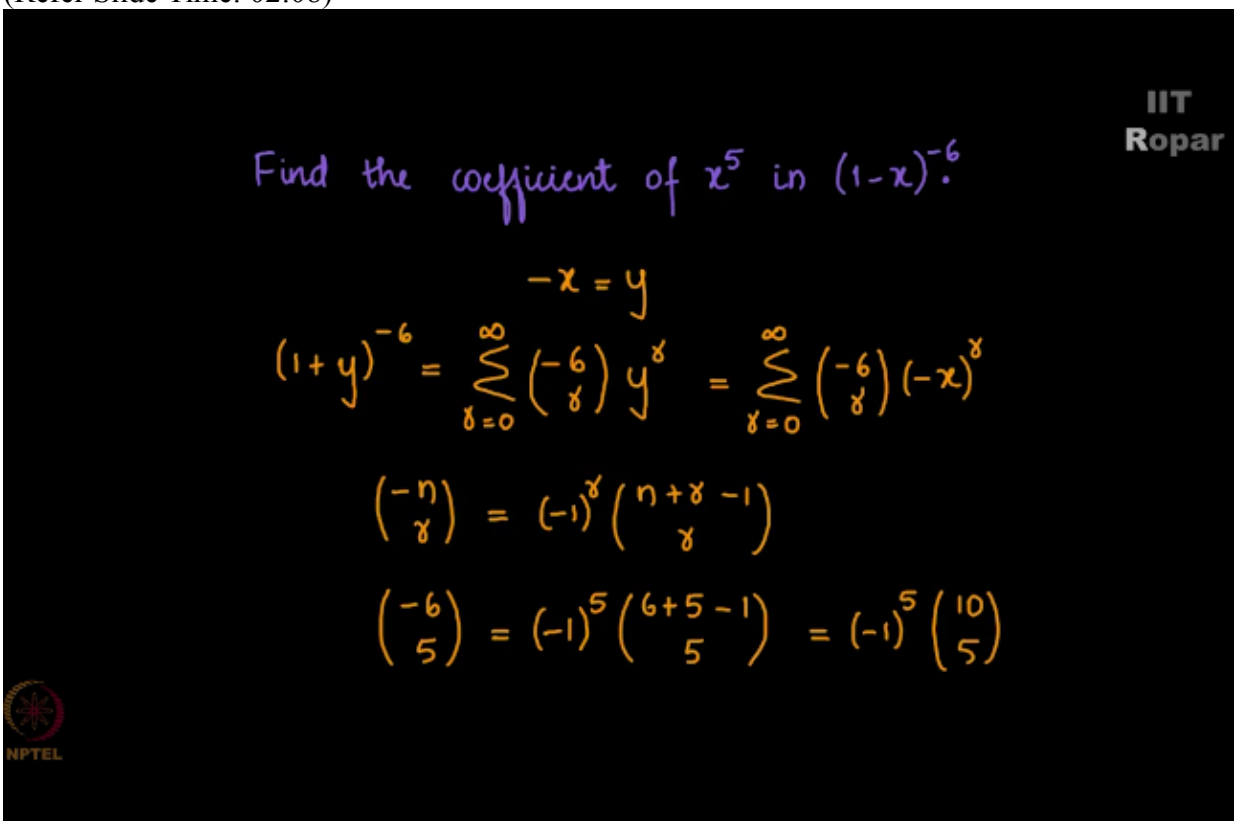


Now the coefficient of X to the 5 is you see –N choose R is what? -1 to the R into N + R-1 choose R,

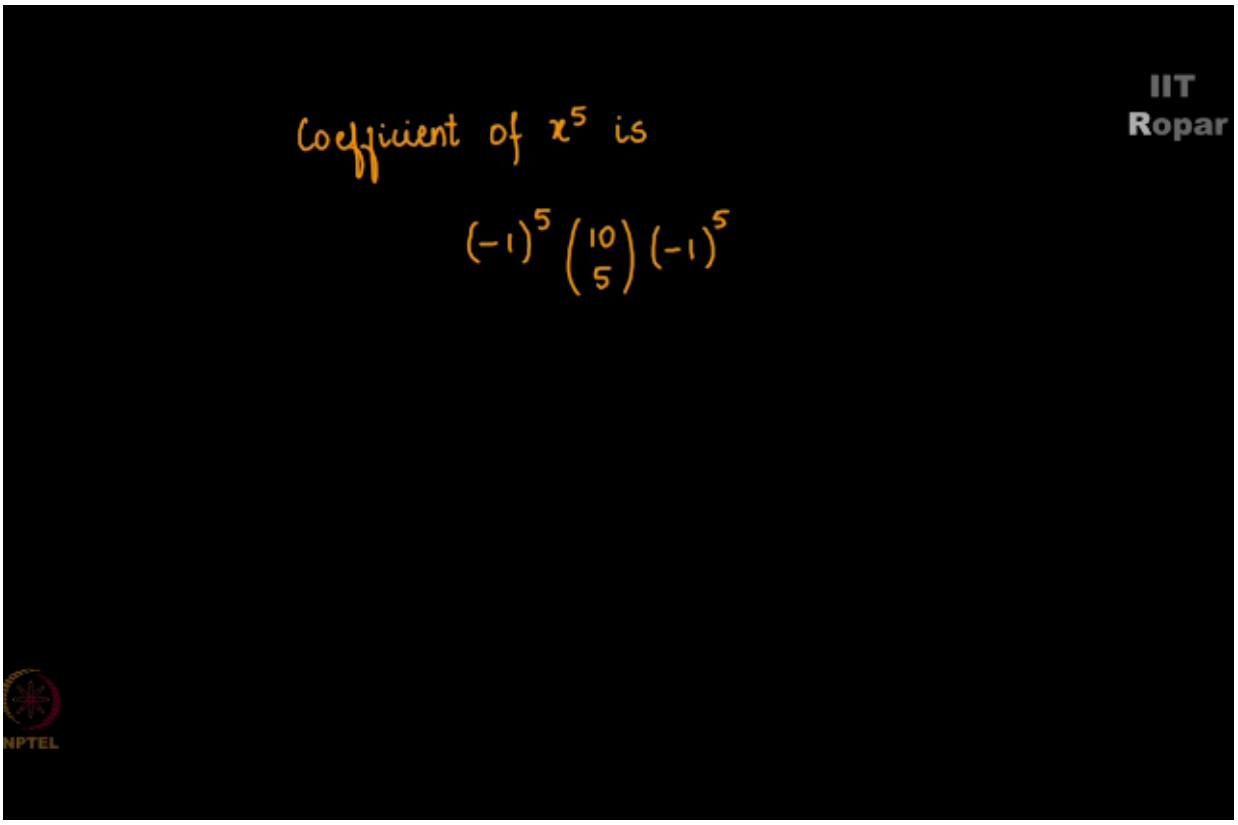
(Refer Slide Time: 01:47)



so -6 choose 5 can be written as -1 to the 5, R as 5 here and N is 6, so it becomes -1 to the 5 into N + R -1 is 6 + 5-1 which is 10, so 10 choose 5 into -1 to the 5 into X to the 5 it is,
(Refer Slide Time: 02:08)

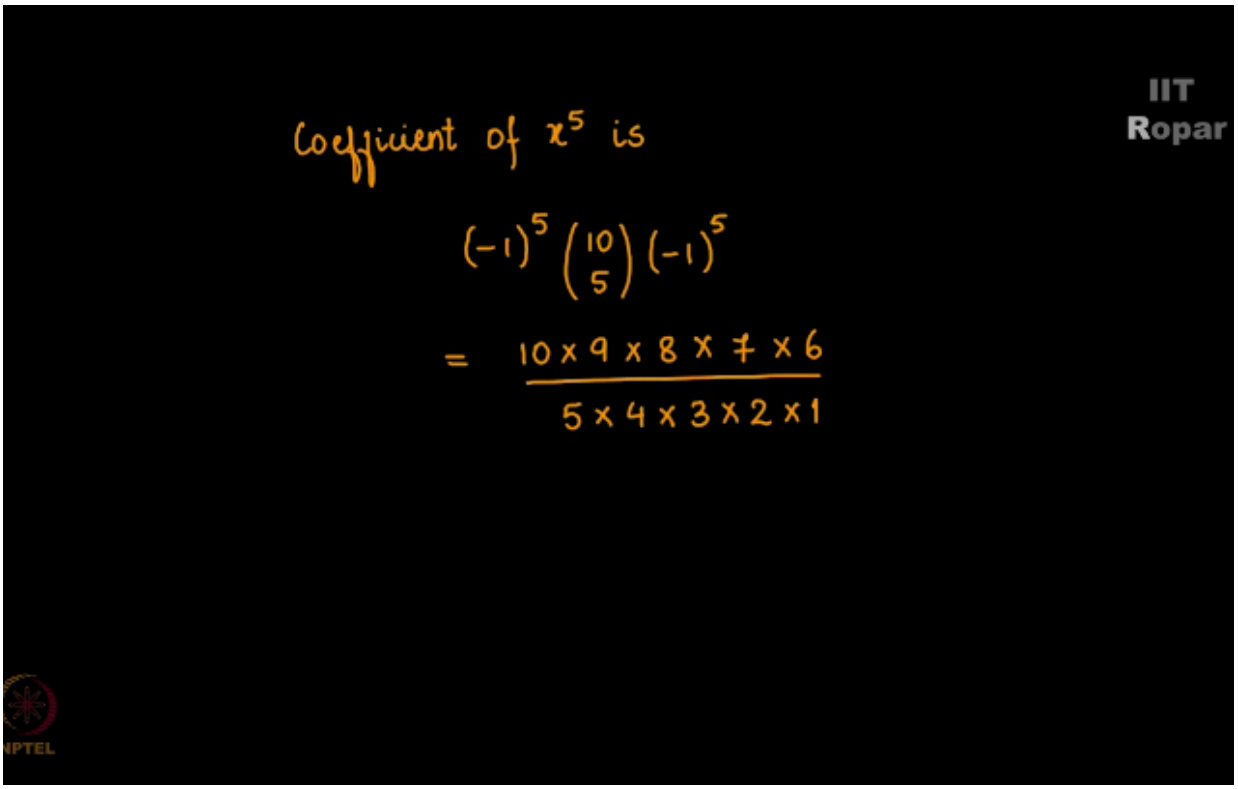


and hence for the coefficient of X to the 5 we consider -1 to the 5 into 10 choose 5 into -1 to the 5,
(Refer Slide Time: 02:20)



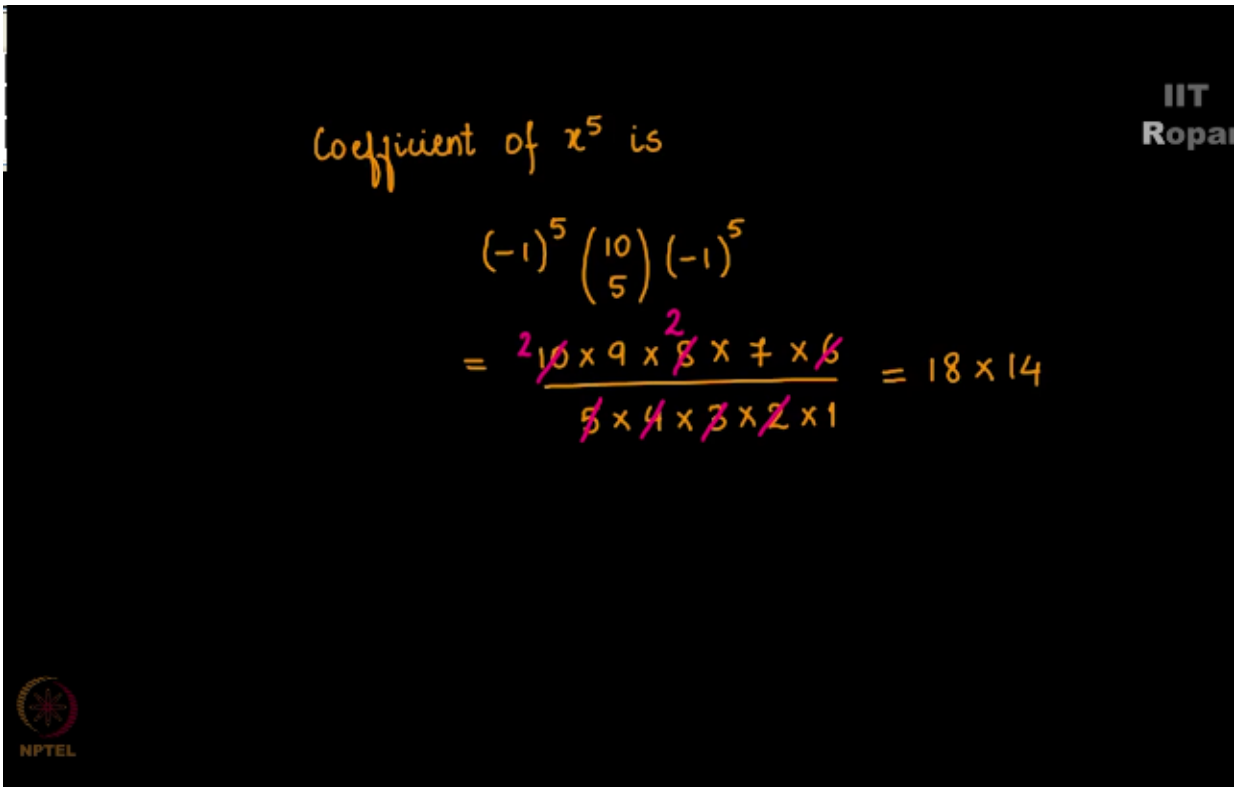
so -1 and -1 become +1 here, now what remains is 10 choose 5, so the coefficient of X to the 5 is 10 choose 5 on simple calculation we see that it is 10 x 9 x 8 x 7 x 6 divided by 5 x 4 x 3 x 2 x 1,

(Refer Slide Time: 02:42)



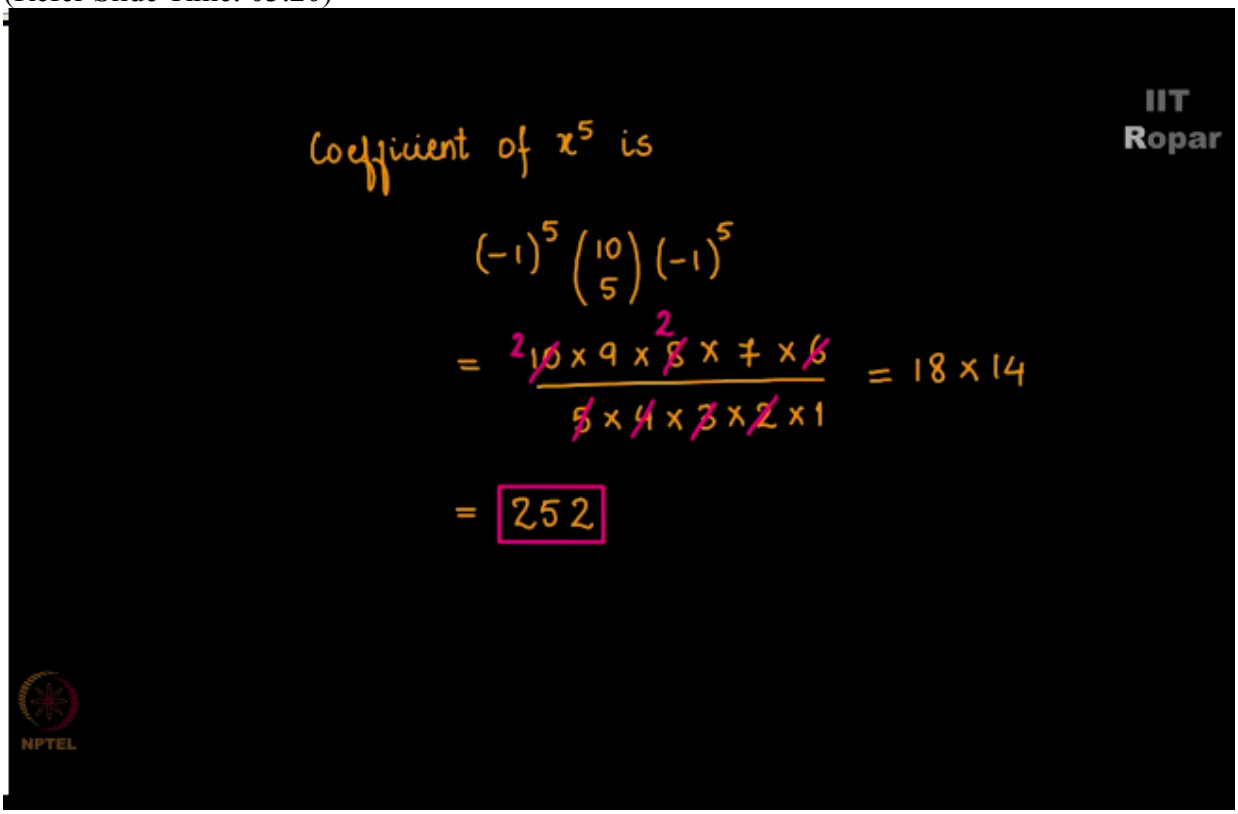
now you must be knowing this formula very well by now, we have studied in week 1 right, so I didn't stated explicitly assuming that you guys know the formula of NCR.

Now on simplification this becomes 18 x 14, I've canceled 5 and 10, and 4 and 8, 6 and 6 get canceled here, and so on, so you can check it out yourself,
(Refer Slide Time: 03:08)



so the answer would be 252, so the coefficient of X to the 4 in 1-X whole to the -6 is 252.

(Refer Slide Time: 03:20)



IIT MADRAS PRODUCTION

Founded by
Department of Higher Education
Ministry of Human Resources Development
Government of India

www.nptel.iitm.ac.in