**NPTEL**
**NPTEL ONLINE COURSE**

**Discrete Mathematics**
**Mathematical Induction and pigeonhole principle**

**MI - Inequality 2**

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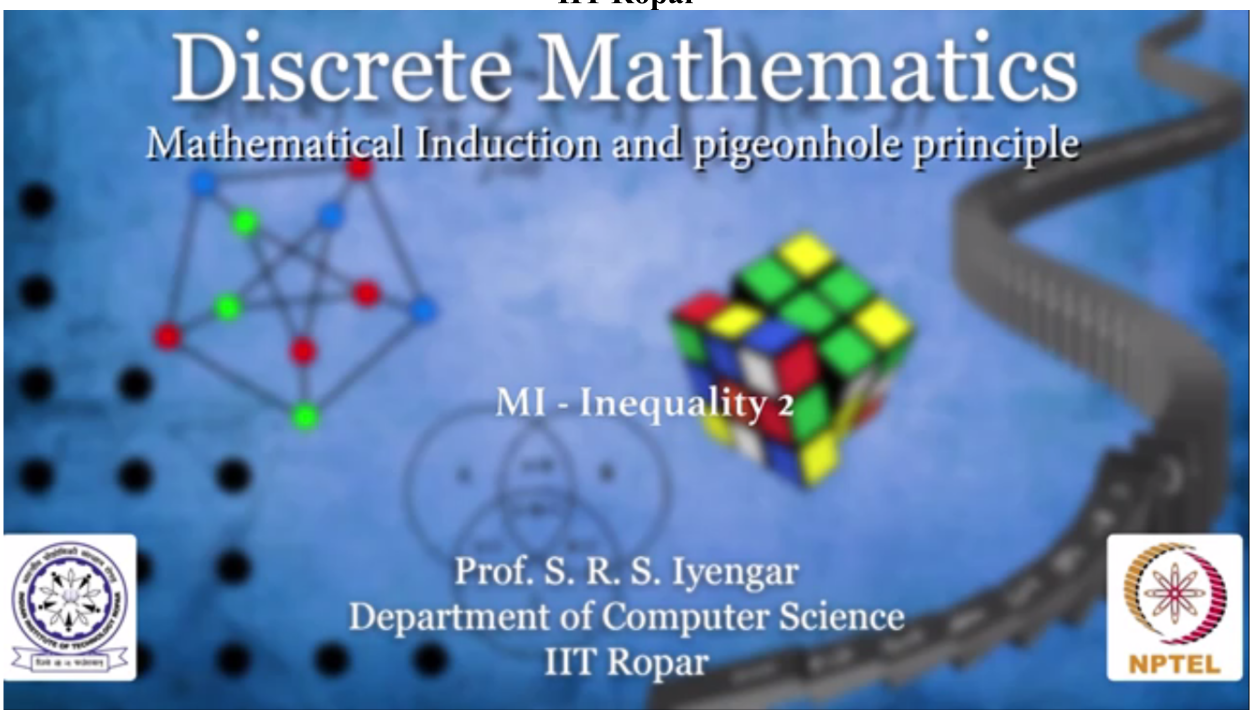
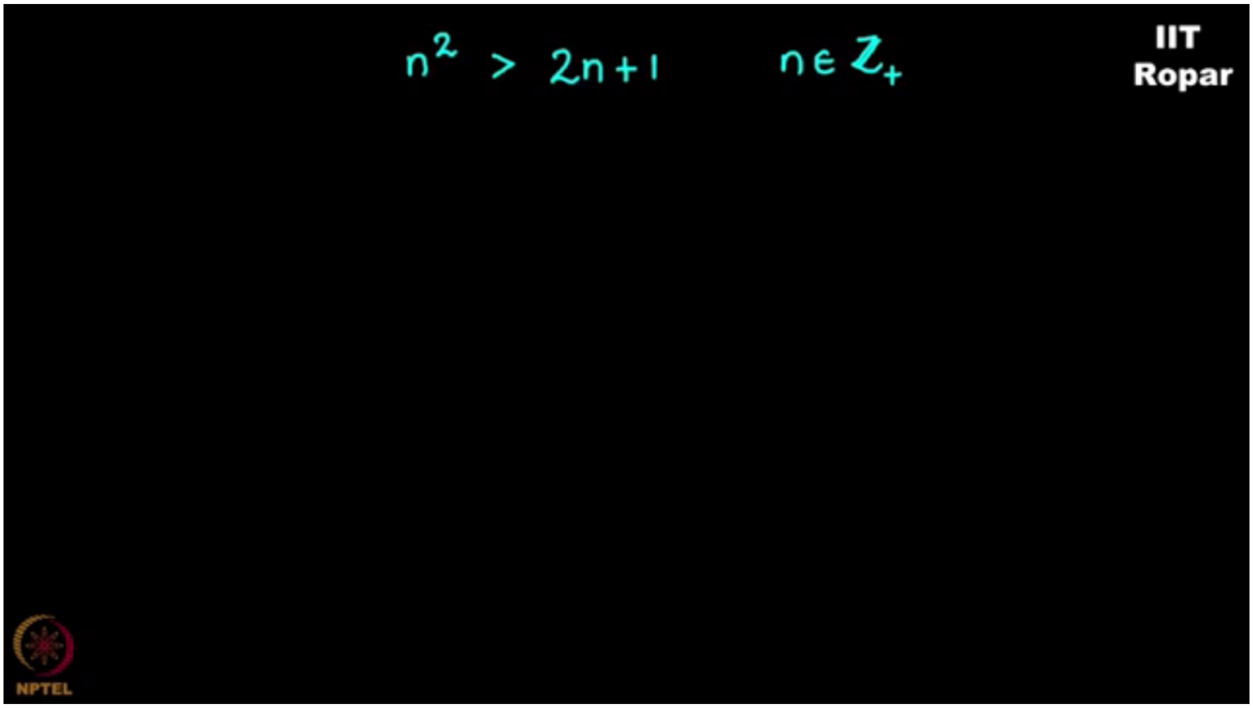
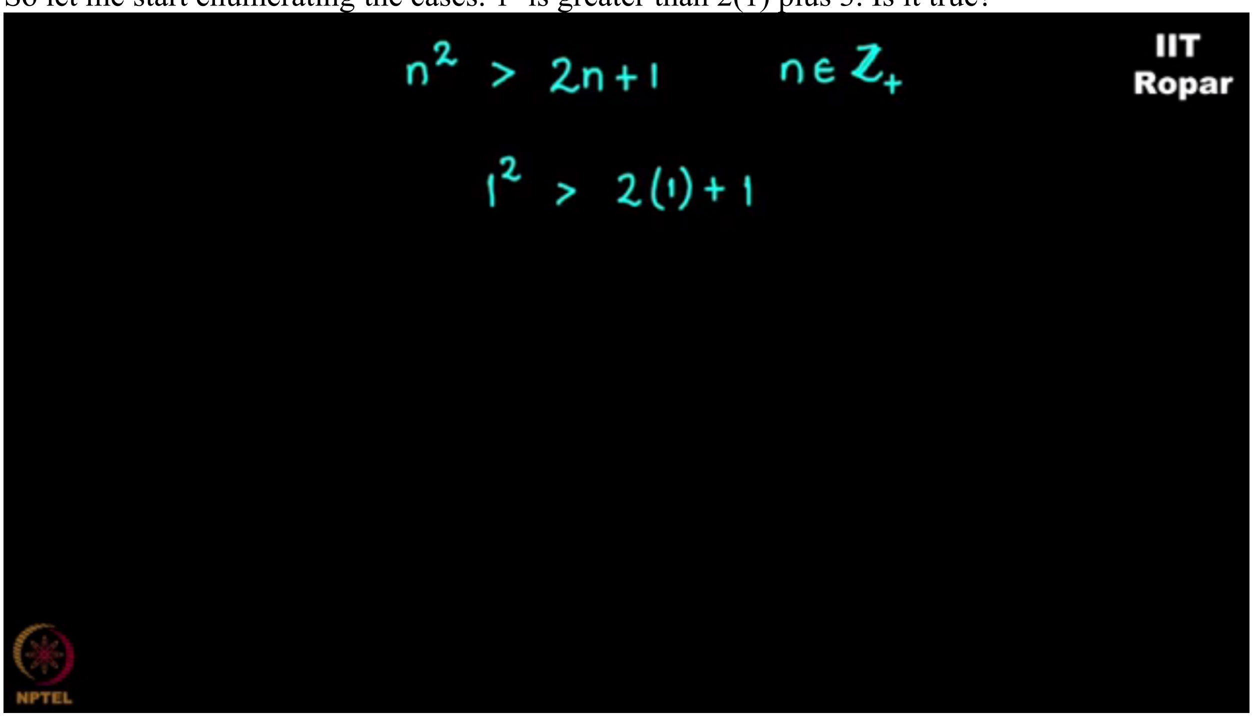


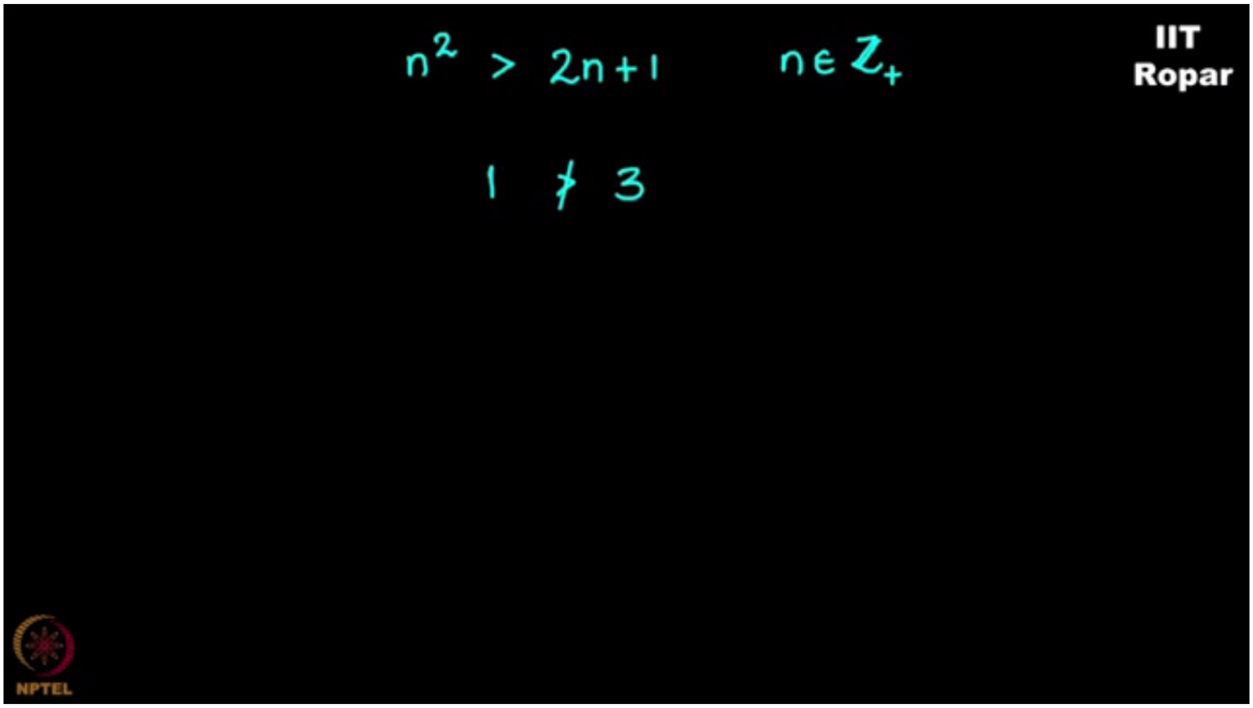

Consider this inequality $n^2$ is greater than 2n+1. Unlike the previous problem where I gave you the expressions and I told you to observe the patterns, here I am directly giving you the expression. So it is $n^2$ is greater than 2n+1. Here I am going to assume that n is a positive integer.



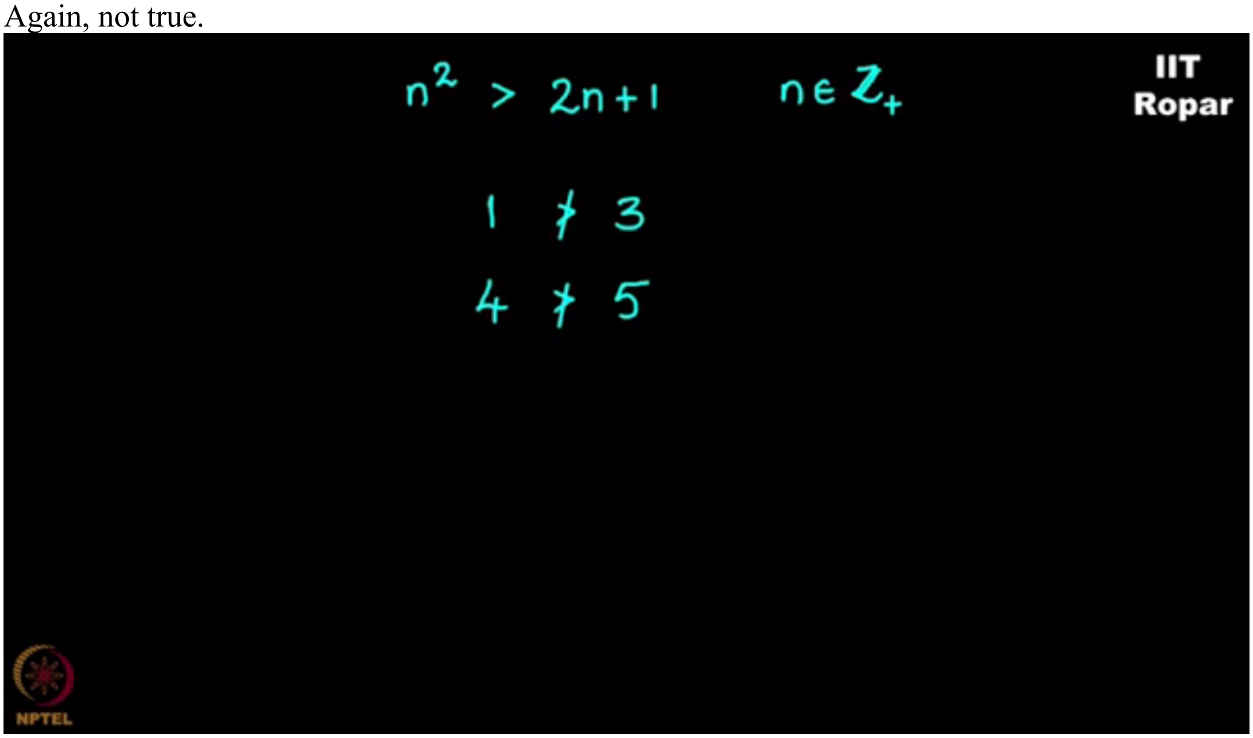

So let me start enumerating the cases. $1^2$ is greater than 2(1) plus 3. Is it true?



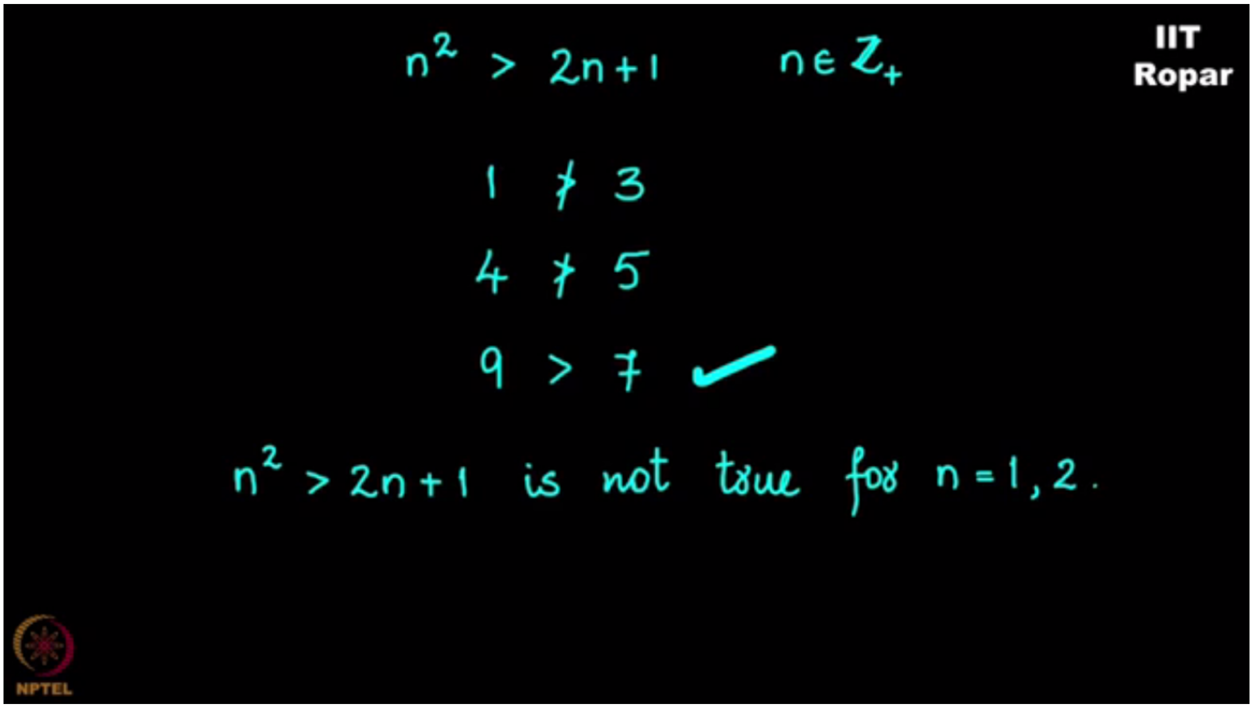

1, $1^2$ is 1. 1 is greater than 2+1, which is 3. No. 1 is not greater than 3.



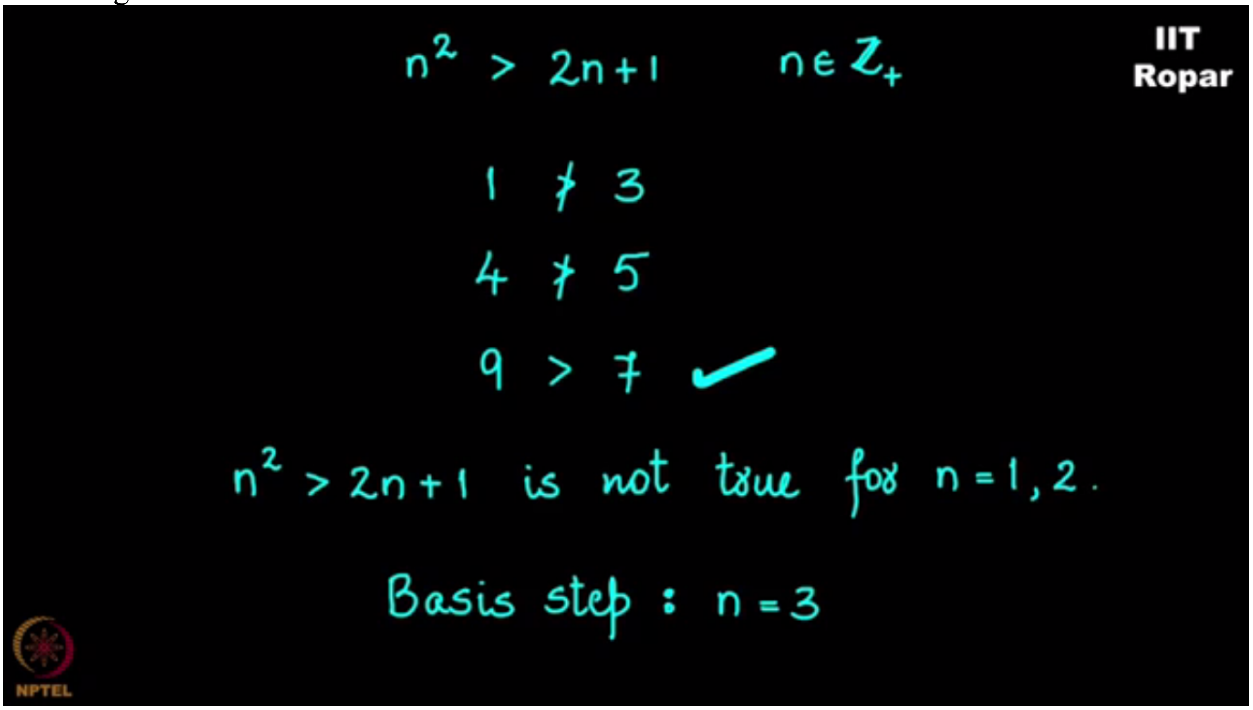

Let me just go ahead and try with n = 2. $2^2$ is greater than 2(2)+1, which is 4 is greater than 5. Again, not true.




Let me try it for 3. $3^2$ is greater than 2(3)+1. 9 is greater than 7. Yes. Here we see that this inequality is true. So what do we see? We see that $n^2$ greater than 2n+1 is not true for n = 1 and 2. It starts becoming true for n = 3 onwards.




This is a huge hint for all of you to prove using induction. Why? Because I am telling you that basis step does not start with 1. It starts with 3. This is a great example where you can see that basis step need not always start from 1. It is always problem dependent and here it starts becoming true from n = 3.




Now go ahead and prove it using induction and consider the basis step from n = 3. We will give you the solution in the next video.

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