



IIT Madras
ONLINE DEGREE

Statistics for Data Science - 1
Professor. Usha Mohan
Department of Management Studies
Indian Institute of Technology, Madras
Week 10 - Tutorial 3

(Refer Slide Time: 0:14)



Let X be a binomial random variable with $E[X] = 9$ and $\text{Var}(X) = 4.95$. Find the value of $P(X = 12)$.

$$\begin{aligned} np &= 9 & np(1-p) &= 4.95 \\ 9 \times (1-p) &= 4.95 \Rightarrow 1-p = \frac{4.95}{9} = 0.55 & \Rightarrow p &= 0.45 \\ np &= 9 & n &= 20, \quad p = 0.45, \quad r = 12 \\ n &= \frac{9}{0.45} = 20 & P(X=12) &= {}^{20}C_{12} (0.45)^{12} (0.55)^8 \end{aligned}$$

Let X we have binomial random variable with expectation this is 9 and variance is 4.95. Find the value of $P(X = 12)$. So, from the given information first we have to find the value of n and p . So, as we know expectation of binomial random variable is given by np and which is given as 9 and variance of binomial distribution is given by $np(1-p)$ which is given as 4.95.

So, from here we can put the value of np . So, we will get that $9 \times (1-p) = 4.95$, we will solve this, we will get that $1-p = \frac{4.95}{9}$ which is nothing but 0.55. So, this implies that the value of p is 0.45, putting this value of p in np , we get $n = \frac{9}{0.45}$ which is nothing is 20.

So, we got the value of n that is 20, we got the value of p 0.45 and we have here the value of r is 12. Now, we will use directly the formula for binomial distribution and we can see that this can be written as ${}^{20}C_{12} 0.45^{12} 0.55^8$ the value of r that is 12, $(1-p)$ that is 0.55, 0.55^{n-r} that is nothing but 8, $20 - 12$ that is 8. So, this will be our value of $P(X = 12)$. Thank you.