# Bonus Question
## AI1110: Probability and Random Variables

Rishitha Surineni

cs22btech11050

**Question:**
It is known that 10% of certain articles manufactured are defective.What is the probability that in a random sample space of 12 such articles, 9 are defective?

**Solution:**
This experiment has a Binomial Distribution with n = 12 and p = 0.1.

Let, E be the event that exactly 9 articles are defective.

The mean and standard deviation of the Binomial distribution are

$$\mu = np \tag{1}$$
$$\mu = 12 \times 0.1 \tag{2}$$
$$\mu = 1.2 \tag{3}$$
$$\sigma = \sqrt{np(1-p)} \tag{4}$$
$$\sigma = \sqrt{12 \times 0.1 \times 0.9} \tag{5}$$
$$\sigma = 1.04 \tag{6}$$

z-score for the event E can be calculated as

$$z = \frac{x - np}{\sqrt{np(1-p)}} \tag{7}$$
$$z = \frac{9 - 1.2}{1.04} \tag{8}$$
$$z = 7.5 \tag{9}$$

From the Standard Normal Distribution table,
The probability of an event having z-score greater than 7.5 is very low and is equal to $4.338751580235112 \times 10^{-13}$

Therefore, $\Pr(E) = 4.338751580235112 \times 10^{-13}$



Binomial PMF and Gaussian PDF for (n=12, p=0.1)