

6) A bag consists of 10 balls each marked with one of the digits 0 to 9. If four balls are drawn successively with replacement from the bag, what is the probability that none is marked with the digit 0?

Ans:- Let X denote the number of balls marked with the digit 0 among the 4 balls drawn. Since the balls are drawn with replacement, the trials are Bernoulli trials.

X has a binomial distribution with $n=4$ and $p=\frac{1}{10}$.

$$\therefore q = 1 - p = 1 - \frac{1}{10} = \frac{9}{10}$$

$$\begin{aligned} \therefore P(X=x) &= {}^n C_x p^x q^{n-x}, \text{ where} \\ & \quad x = 0, 1, 2, \dots, n \\ &= {}^4 C_x \left(\frac{1}{10}\right)^x \left(\frac{9}{10}\right)^{4-x} \end{aligned}$$

$P(\text{none marked with } 0)$

$$= P(X=0)$$

$$= {}^4 C_0 \left(\frac{1}{10}\right)^0 \left(\frac{9}{10}\right)^4 = \left(\frac{9}{10}\right)^4$$