Problem Set -4

1.

i) with replacement

Total number of balls = 10

Total no of white balls = 4

Total no of black balls = 6

P(Pick 3 balls among 5 are white) =

$$P\left(\begin{array}{l}\text{Picking 3 balls out of}\\ \text{5 without replacement}\\ \text{\& order does not matter}\end{array}\right) \text{ AND}$$

$$P\left(\begin{array}{l}\text{Picking 3 balls out of}\\ \text{4 with replacement \&}\\ \text{order matters}\end{array}\right) \text{ AND } P\left(\begin{array}{l}\text{Pick 2 black}\\ \text{balls out of 6}\\ \text{with replacement}\\ \text{\& order matters}\end{array}\right)$$

$$= {}^5C_3 \times \left(\frac{4}{10} \times \frac{4}{10} \times \frac{4}{10}\right) \times \left(\frac{6}{10} \times \frac{6}{10}\right)$$

$$= {}^5C_3 \times \left(\frac{4}{10}\right)^3 \times \left(\frac{6}{10}\right)^2$$

ii) without replacement scenario is called hypergeometric Experiment.

Total number of balls = 10 (N)

Total number of white balls = 4 (K)

total number of picking balls = 5 (n)

total number of white balls drawn = 3 (k)

$$= \frac{\binom{K}{k}\binom{N-K}{n-k}}{\binom{N}{n}}$$

$$= \frac{\binom{4}{3}\binom{10-4}{5-3}}{\binom{10}{5}}$$

$$= 0.2381 \simeq 23.81\%$$