

Probability Assignment 1

EE22BTECH11217 - Sayan Biswas

1 PROBLEM STATEMENT

Two balls are drawn at random with replacement from box containing 10 black and 8 red balls. Find the probability that :

- 1) both balls are red
- 2) one of them is black and the other one is red

2 ANSWER

Defining random variable X_j such that:

- 1) X_j : Colour of j^{th} ball picked

$$X_j = \begin{cases} 1, & \text{Red ball} \\ 0, & \text{Black ball} \end{cases} \quad (1)$$

For picking two balls, $j = 1, 2$

Let us define, $X = X_1 + X_2$

$$X = \begin{cases} 0, & \text{none are red} \\ 1, & \text{one of them red} \\ 2, & \text{both red} \end{cases} \quad (2)$$

$$X \sim \text{Bin}(n, p) \quad (3)$$

$$p = \frac{4}{9} \quad (4)$$

$$n = 2 \quad (5)$$

- 2) Both balls are red :

$$\Pr(X = 2) = {}^2C_2 \left(\frac{4}{9}\right)^2 \left(\frac{5}{9}\right)^0 \quad (6)$$

$$= \frac{16}{81} \quad (7)$$

- 3) One of them is black and other is red :

$$\Pr(X = 1) = {}^2C_1 \left(\frac{4}{9}\right)^1 \left(\frac{5}{9}\right)^1 \quad (8)$$

$$= \frac{40}{81} \quad (9)$$