

Probability Assignment 1

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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) first ball is black and second ball is red
- 3) one of them is black the other one is red

2 ANSWER

Assume random variable X and Y:

- X: Colour of first ball picked

$$X_1 = \begin{cases} 1, & \text{for red ball} \\ 0, & \text{for black ball} \end{cases}$$

- Y: Colour of second ball picked

$$X_2 = \begin{cases} 1, & \text{for red ball} \\ 0, & \text{for black ball} \end{cases}$$

- Both balls are red :

$$= \Pr(X_1 = 1, X_2 = 1) \quad (1)$$

$$= \left(\frac{{}^8C_1}{{}^{18}C_1} \right) \times \left(\frac{{}^8C_1}{{}^{18}C_1} \right) \quad (2)$$

$$= \frac{16}{81} \quad (3)$$

- First ball is black and second is red :

$$= \Pr(X_1 = 0, X_2 = 1) \quad (4)$$

$$= \left(\frac{{}^{10}C_1}{{}^{18}C_1} \right) \times \left(\frac{{}^8C_1}{{}^{18}C_1} \right) \quad (5)$$

$$= \frac{20}{81} \quad (6)$$

- One of them is black and other is red :

$$= \Pr(X_1 = 1, X_2 = 0) + \Pr(X_1 = 0, X_2 = 1) \quad (7)$$

$$= \left(\frac{{}^8C_1}{{}^{18}C_1} \right) \times \left(\frac{{}^{10}C_1}{{}^{18}C_1} \right) + \left(\frac{{}^{10}C_1}{{}^{18}C_1} \right) \times \left(\frac{{}^8C_1}{{}^{18}C_1} \right) \quad (8)$$

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