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) one of them is black the other one is red

2 Answer

Assume random variable X and Y:

1) X_1: Colour of first ball picked

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

2) X_2: Colour of second ball picked

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

3) Both balls are red :

$$= \Pr\left(\sum_{i=1}^{2} X_i = 1\right) \tag{1}$$

$$= {}^{n}C_i \left(\frac{8}{18}\right)^{i} \times \left(\frac{10}{18}\right)^{n-i} \tag{2}$$

$$= {}^{2}C_2 \left(\frac{8}{18}\right)^{2} \times \left(\frac{10}{18}\right)^{0} \tag{3}$$

4) One of them is black and other is red :

$$= \Pr\left(\sum_{i=1}^{2} X_i = (1,0)\right) \tag{4}$$

$$= {}^{n}C_i \left(\frac{8}{18}\right)^{i} \times \left(\frac{10}{18}\right)^{n-i} \tag{5}$$

$$= {}^{2}C_1 \left(\frac{8}{18}\right)^{1} \times \left(\frac{10}{18}\right)^{1} \tag{6}$$