

Assignment-1

(10.15.1.9)

AI1110:Probability and Random Variables

Indian Institute of Technology, Hyderabad

Parth Ajit Kansagra*
CS22BTECH11045
26 April, 2023

Question: A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be :

- (i) red ?
- (ii) white ?
- (iii) not green?

Solution :

Number of red marbles = 5
Number of white marbles = 8
Number of green marbles = 4
Total marbles = 5+8+4 = 17
Let

$$N = R + W + G \quad (1)$$

$$n = r + w + g \quad (2)$$

where R,B,G and r, b, g represent the number of red, white and green marbles respectively within N and n. Then :

$$\Pr(r, w, g) = \frac{{}^R C_r {}^W C_w {}^G C_g}{{}^{R+W+G} C_{r+w+g}} \quad (3)$$

- (i) Probability that the marble taken out is red

$$= \frac{\text{Number of red marbles}}{\text{Total number of marbles}} \quad (4)$$

Probability that the marble taken out is red:

$$\Pr(1, 0, 0) = \frac{{}^5 C_1 {}^8 C_0 {}^4 C_0}{{}^{17} C_1} \quad (5)$$

$$\therefore \Pr(1, 0, 0) = \frac{5}{17} \approx 0.2941 \quad (6)$$

- (ii) Probability that the marble taken out is white

$$= \frac{\text{Number of white marbles}}{\text{Total number of marbles}} \quad (7)$$

Probability that the marble taken out is white:

$$\Pr(0, 1, 0) = \frac{{}^5 C_0 {}^8 C_1 {}^4 C_0}{{}^{17} C_1} \quad (8)$$

$$\therefore \Pr(0, 1, 0) = \frac{8}{17} \approx 0.4706 \quad (9)$$

- (iii) Probability that the marble taken out is not green

$$= \frac{\text{Number of non green marbles}}{\text{Total number of marbles}} \quad (10)$$

Probability that the marble taken out is not green:

$$\Pr(1, 0, 0) + \Pr(0, 1, 0) = \frac{{}^5 C_1 {}^8 C_0 {}^4 C_0}{{}^{17} C_1} + \frac{{}^5 C_0 {}^8 C_1 {}^4 C_0}{{}^{17} C_1} \quad (11)$$

$$\therefore \Pr(1, 0, 0) + \Pr(0, 1, 0) = \frac{13}{17} \approx 0.7647 \quad (12)$$