Assignment-1
(10.15.1.9)
AI1110:Probability and Random Variables
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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

X	Outcome
0	Red Marble
1	White Marble
2	Green Marble

Let

$$N = R + W + G \tag{1}$$

$$n = r + w + g \tag{2}$$

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

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

(i) Probability that the marble taken out is red

$$= \frac{\text{Number of red marbles}}{\text{Total number of marbles}} \tag{4}$$

Probability that the marble taken out is red:

$$\Pr(1,0,0) = \frac{{}^{5}C_{1}\,{}^{8}C_{0}\,{}^{4}C_{0}}{{}^{17}C_{1}} \tag{5}$$

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

(ii) Probability that the marble taken out is white

$$= \frac{\text{Number of white marbles}}{\text{Total number of marbles}} \tag{7}$$

Probability that the marble taken out is white:

$$\Pr(0,1,0) = \frac{{}^{5}C_{0}\,{}^{8}C_{1}\,{}^{4}C_{0}}{{}^{17}C_{1}} \tag{8}$$

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

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

$$= \frac{\text{Number of non green marbles}}{\text{Total number of marbles}} \tag{10}$$

Probability that the marble taken out is not green:

$$\Pr(1,0,0) + \Pr(0,1,0) = \frac{{}^{5}C_{1}\,{}^{8}C_{0}\,{}^{4}C_{0}}{{}^{17}C_{1}} + \frac{{}^{5}C_{0}\,{}^{8}C_{1}\,{}^{4}C_{0}}{{}^{17}C_{1}} \tag{11}$$

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