AI 1103 - Assignment 2

T. Rohan
CS20BTECH11064

Download all python codes from

https://github.com/rohanthota/Assignment_2/codes/Assignment_2.py

and latex codes from

https://github.com/rohanthota/Assignment_2/Assignment 2.tex

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

1) red ?
2) white ?
3) not green?

Solution

Total number of marbles = 5 + 8 + 4 = 17 marbles.

Here, we define random variable $X \in \{0, 1, 2\}$
Where,
X = 0 refers to the case of picking a red marble
X = 1 refers to the case of picking a white marble
X = 2 refers to the case of picking a green marble

1) The probability that a red marble was picked, can also be written as $\Pr(X = 0)$

$$\Pr(X = 0) = \frac{\text{number of red marbles}}{\text{total number of marbles}} = \frac{5}{17}$$
$$\therefore \Pr(X = 0) = \frac{5}{17} = 0.294118 \quad (0.0.1)$$

2) The probability that a white marble was picked, can be written as $\Pr(X = 1)$

$$\Pr(X = 1) = \frac{\text{number of white marbles}}{\text{total number of marbles}} = \frac{8}{17}$$
$$\therefore \Pr(X = 1) = \frac{8}{17} = 0.470589 \quad (0.0.2)$$

3) The probability that the marble picked was not green can be written as $\Pr(X \neq 2)$. (0.0.3)

We know that $\Pr(X \neq 2) + \Pr(X = 2) = 1$. (0.0.4)

(because they are complimentary events.)

$$\Pr(X = 2) = \frac{\text{number of green marbles}}{\text{total number of marbles}} = \frac{4}{17}.$$
$$\Rightarrow \Pr(X = 2) = \frac{4}{17} = 0.235294$$
$$\Rightarrow \Pr(X \neq 2) = 1 - \Pr(X = 2) = 0.764706$$
$$\therefore \Pr(X \neq 2) = 0.764706 \quad (0.0.5)$$

Tables and Graphs

Conditions	X = 0	X = 1	X ≠ 2
$\Pr(X)$	$\frac{5}{17}$	$\frac{8}{17}$	$\frac{13}{17}$

TABLE 3: Values of theoretical probabilities

Conditions	X = 0	X = 1	X ≠ 2
$\Pr(X)$	0.2937	0.4710	0.7647

TABLE 3: Values of probabilities after simulations in python.

Drawing the comparison graph with ages on x-axis, probabilities on y-axis, blue bar representing simulations and orange bar representing theoretical value, we get