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AI 1103 - Assignment 2

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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)

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

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

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

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

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

(because they are complimentary events.)

$$Pr(X = 2) = \frac{\text{number of green marbles}}{\text{total number of marbles}} = \frac{4}{17}.$$

$$\Rightarrow Pr(X = 2) = \frac{4}{17} = 0.235294$$

$$\Rightarrow Pr(X \neq 2) = 1 - Pr(X = 2) = 0.764706$$

$$\therefore Pr(X \neq 2) = 0.764706$$

TABLES AND GRAPHS

1) Table representing probabilities of the different situations (theoretical values).

Conditions	X = 0	X = 1	X ≠ 2
Theor. Prob.	$\frac{5}{17}$	$\frac{8}{17}$	$\frac{13}{17}$

Table representing probabilities after simulations in python.

Conditions	X = 0	X = 1	X ≠ 2
Simulated Prob.	0.293678	0.471032	0.76471

2) 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

Comparison plot between simulated and theoretical estimations.

Simulations' data

Theoretical data

O.5

O.5

O.7

Red

White

Not Green

--Conditions---