# 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 ∈ { 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

| 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