ASSIGNMENT 3

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Question: A box contains 3 blue, 2 white and 4 red marbles.If a marble is drawn at random from the box, what is the probability that it will be

(i) white?
(ii) blue?
(iii) red?

Solution: Given there are 2 white, 3 blue and 4 red marbles.
Total number of possible outcomes = 2 + 3 + 4 = 9

Let's a random variable X such that $X \in \{0, 1, 2\}$ denote the outcome of the given problem.

Event	Description
X=0	white marble is drawn
X=1	blue marble is drawn
X=2	red marble is drawn

TABLE I: Random variable and Event distribution

(i) The number of outcomes favourable to the event $X = 0$ is 2.
The probability that a marble is drawn at random from the box is white

$$\Pr(X = 0) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} \tag{1}$$

$$= \frac{2}{9} \tag{2}$$

$$= 0.222 \tag{3}$$

(ii) The number of outcomes favourable to the event $X = 1$ is 3.
The probability that a marble is drawn at random from the box is blue

$$\Pr(X = 1) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} \tag{4}$$

$$= \frac{3}{9} \tag{5}$$

$$= \frac{1}{3} \tag{6}$$

$$= 0.333 \tag{7}$$

(iii) The number of outcomes favourable to the event $X = 2$ is 4.
The probability that a marble is drawn at random from the box is red

$$\Pr(X = 2) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}} \tag{8}$$

$$= \frac{4}{9} \tag{9}$$

$$= 0.444 \tag{10}$$

Note: Since the events are mutually exclusive and exhaustive, the probability that the ball drawn is red can also be calculated as

$$\Pr(X = 0) + \Pr(X = 1) + \Pr(X = 2) = 1 \tag{11}$$

$$\Pr(X = 2) = 1 - \Pr(X = 0) - \Pr(X = 1) \tag{12}$$

$$= 1 - \frac{2}{9} - \frac{1}{3} \tag{13}$$

$$= \frac{4}{9} \tag{14}$$

$$= 0.444 \tag{15}$$