

# 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  $X \in \{0, 1\}$  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

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

$$= \frac{2}{9} \quad (2)$$

$$= 0.222 \quad (3)$$

(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

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

$$= \frac{3}{9} \quad (5)$$

$$= \frac{1}{3} \quad (6)$$

$$= 0.333 \quad (7)$$

(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

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

$$= \frac{4}{9} \quad (9)$$

$$= 0.444 \quad (10)$$

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

$$\Pr(X = 0) + \Pr(X = 1) + \Pr(X = 2) = 1 \quad (11)$$

$$\Pr(X = 2) = 1 - \Pr(X = 0) - \Pr(X = 1) \quad (12)$$

$$= 1 - \frac{2}{9} - \frac{1}{3} \quad (13)$$

$$= \frac{4}{9} \quad (14)$$

$$= 0.444 \quad (15)$$