

# Assignment 5

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## Question :

A die has two faces each with number '1', three faces each with number '2' and one face with number '3'. If the die is rolled once, determine

$$\Pr(X = 1) = \frac{2}{6} = 0.33 \quad (1)$$

$$\Pr(X = 2) = \frac{3}{6} = 0.5 \quad (2)$$

$$\Pr(X = 3) = \frac{1}{6} = 0.166 \quad (3)$$

1.  $P(2)$

2.  $P(1 \text{ or } 3)$

3.  $P(\text{not } 3)$

The Events  $X = 1$ ,  $X = 2$  and  $X = 3$  are mutually exclusive because when we roll a die exactly one of 1, 2, 3 appear at the top.

$$\Rightarrow \Pr((X = i) \cap (X = j)) = 0 \forall i, j \in \{1, 2, 3\} \quad (4)$$

We know that for any two events  $A, B$   
 $\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$   
Let  $X = 1$  be the event  $A$  and  $X = 3$  be the event  $B$

But here  $\Pr(A \cap B) = 0$  from (4)

$$\Rightarrow \Pr(A \cup B) = \Pr(A) + \Pr(B) \quad (5)$$

$$\Rightarrow \Pr(A \cup B) = \frac{2}{6} + \frac{1}{6} \quad (6)$$

$$\Rightarrow \Pr(A \cup B) = \frac{3}{6} \quad (7)$$

$$\Rightarrow \Pr(A \cup B) = 0.5 \quad (8)$$

$$\therefore \Pr((X = 1) \cup (X = 3)) = 0.5 \quad (9)$$

## Solution :

Given the numbers present on the six faces of die are 1, 1, 2, 2, 2, 3.

Let  $S$  denote the Sample space of the experiment.

$$\Rightarrow S = \{1, 1, 2, 2, 2, 3\}$$

Let  $X$  be the random variable that denotes the number obtained on the top when the die is rolled.

$$\Rightarrow X \in \{1, 2, 3\}$$

We know that for any event  $A$  it's complementary event is denoted by  $A^c$

And  $\Pr(A) + \Pr(A^c) = 1$

Let  $X = 3$  be the event  $A$

$$\Rightarrow \Pr(A^c) = 1 - \Pr(A) \quad (10)$$

$$\Rightarrow \Pr(A^c) = 1 - \frac{1}{6} \quad (11)$$

$$\Rightarrow \Pr(A^c) = \frac{5}{6} \quad (12)$$

$$\therefore \Pr((X = 3)^c) = 0.88 \quad (13)$$