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

1. P(2)
2. P(1 or 3)
3. P(not 3)

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

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

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

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

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.

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

We know that for ant 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)

$$\Rightarrow \Pr(A \cup B) = \Pr(A) + \Pr(B) \tag{5}$$

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

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

$$\Rightarrow \Pr(A \cup B) = 0.5 \tag{8}$$

$$\therefore \Pr((X = 1) \cup (X = 3)) = 0.5 \tag{9}$$

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

$$\Rightarrow \Pr(A^c) = 1 - \Pr(A) \tag{10}$$

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

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

$$\therefore \Pr((X = 3)^c) = 0.88 \tag{13}$$

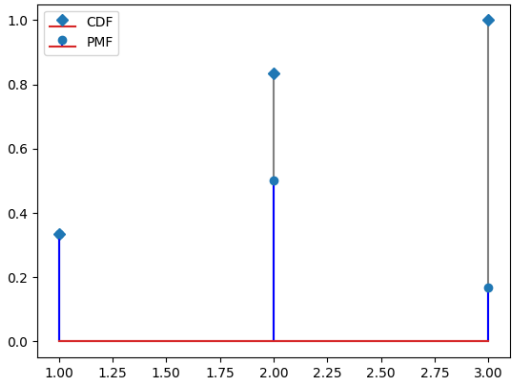

Figure 1: PMF and CDF the distribution