

# Assignment 6

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# Outline

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- Part(i)
- Part(ii)

## Question

Let  $X$  denote the number of hours you study during a randomly selected school day. The probability that  $X$  can take values  $x$ , has the following form, where  $k$  is some unknown constant.

$$Pr(X = x) = \begin{cases} 0.1 & x = 0 \\ kx & x = 1, 2 \\ k(5 - x) & x = 3, 4 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

- (i) Find the value of  $k$ .
- (ii) What is the probability that you study at least two hours? Exactly two hours? Atmost two hours?

# Answer

X is Random variable which can take following values with respective probabilities.

X	0	1	2	3	4
P(X)	0.1	k	2k	2k	k

Table:

## Part(i) -

We know that

$$\sum_{i=1}^n p_i = 1 \quad (2)$$

Therefore

$$\implies 0.1 + k + 2k + 2k + k = 1 \quad (3)$$

$$\implies 0.1 + 6k = 1 \quad (4)$$

$$\implies 6k = 0.90 \quad (5)$$

$$\implies k = \left( \frac{0.90}{6} \right) \quad (6)$$

$$\implies k = 0.15 \quad (7)$$

Now, probabilities become,

X	0	1	2	3	4
P(X)	0.1	0.15	0.30	0.30	0.15

Table:

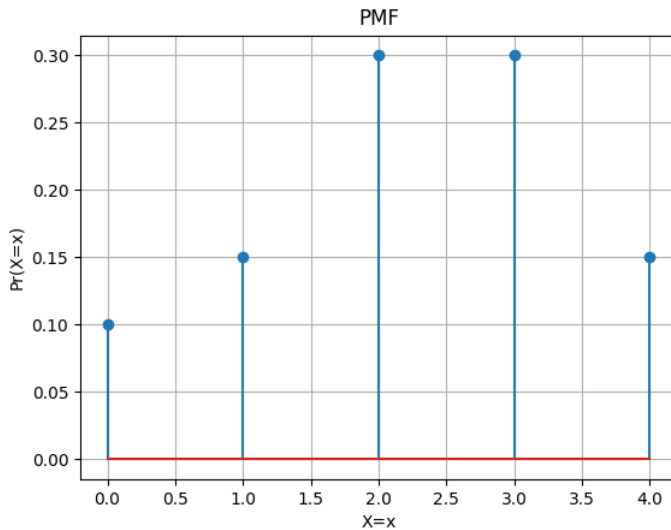


Figure: Probability Mass Function.

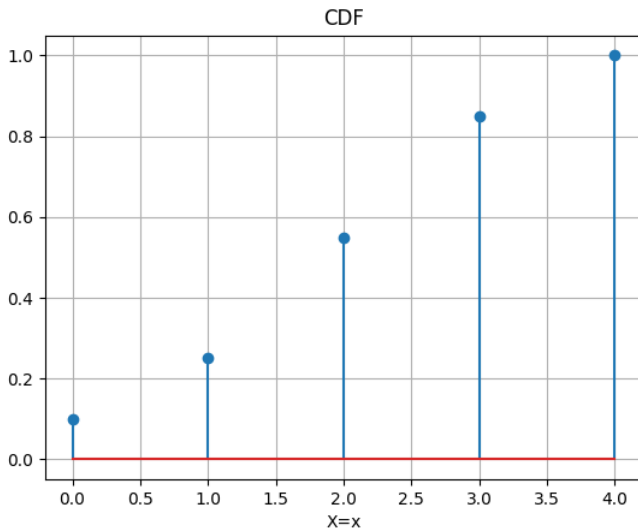


Figure: Cumulative Distribution Function.



## Part(ii) -

- Let A is an event

A: You atleast study two hours

So,

$$Pr(A) = Pr(X \geq 2) \quad (8)$$

$$= Pr(X = 2) + Pr(X = 3) + Pr(X = 4) \quad (9)$$

$$= 2k + 2k + k \quad (10)$$

$$= 5k \quad (11)$$

$$= 5 \times 0.15 \quad (12)$$

$$= 0.75 \quad (13)$$

Hence, probability of you study atleast two hours is 0.75.

- Let B is an event

B: You study exactly two hours

So,

$$Pr(B) = Pr(X = 2) \quad (14)$$

$$= 2k \quad (15)$$

$$= 2 \times 0.15 \quad (16)$$

$$= 0.30 \quad (17)$$

Hence, probability of you study exactly two hours is 0.30.

- Let C is an event

C: You study atmost two hours

So,

$$Pr(C) = Pr(X \leq 2) \quad (18)$$

$$= Pr(X = 0) + Pr(X = 1) + Pr(X = 2) \quad (19)$$

$$= 0.1 + k + 2k \quad (20)$$

$$= 0.1 + 3k \quad (21)$$

$$= 0.1 + 3 \times 0.15 \quad (22)$$

$$= 0.1 + 0.45 \quad (23)$$

$$= 0.55 \quad (24)$$

Hence, probability of you study atmost two hours is 0.55.