Assignment 6

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1 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.

$$Pr(X=x)=\begin{cases}0.1 & x=0\\ kx & x=1,2\\ k\left(5-x\right) & x=3,4\\ 0 & otherwise\end{cases} \tag{1.1}$$

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

2 Answer-

X is Random variable which can take following values.

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

TABLE 2.1

1. We know that

$$\sum_{i=1}^{n} p_i = 1 \tag{2.1}$$

Therefore

$$\implies 0.1+k+2k+2k+k=1 \tag{2.2}$$
$$\implies 0.1+6k=1 \tag{2.3}$$
$$\implies 6k=0.90 \tag{2.4}$$
$$\implies k=\left(\frac{0.90}{6}\right) \tag{2.5}$$
$$\implies k=0.15 \tag{2.6}$$

2. a) Let A is an event
A: You atleast study two hours
So,

$$Pr(A)=Pr(X\geq 2) \tag{2.7}$$
$$=Pr(X=2)+Pr(X=3)+Pr(X=4) \tag{2.8}$$
$$=2k+2k+k \tag{2.9}$$
$$=5k \tag{2.10}$$
$$=5\times 0.15 \tag{2.11}$$
$$=0.75 \tag{2.12}$$

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

b) Let B is an event
B: You study exactly two hours
So,

$$Pr(B)=Pr(X=2) \tag{2.13}$$
$$=2k \tag{2.14}$$
$$=2\times 0.15 \tag{2.15}$$
$$=0.30 \tag{2.16}$$

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

c) Let C is an event
C: You study atmost two hours
So,

$$Pr(C)=Pr(X\leq 2) \tag{2.17}$$
$$=Pr(X=0)+Pr(X=1)+Pr(X=2) \tag{2.18}$$
$$=0.1+k+2k \tag{2.19}$$
$$=0.1+3k \tag{2.20}$$
$$=0.1+3\times 0.15 \tag{2.21}$$
$$=0.1+0.45 \tag{2.22}$$
$$=0.55 \tag{2.23}$$

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