# Assignment 6

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# Outline

# 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.

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

(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

$$\sum_{i=1}^{n} p_i = 1 \tag{2}$$

Therefore

$$\implies 0.1 + k + 2k + 2k + k = 1 \tag{3}$$

$$\implies 0.1 + 6k = 1 \tag{4}$$

$$\implies 6k = 0.90 \tag{5}$$

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

$$\implies k = 0.15 \tag{7}$$

# Part(ii) -

- Let A is an event
  A: You atleast study two hours
  So,

$$
\begin{aligned}
Pr(A) &= Pr(X \geq 2) && (8)\\
&= Pr(X = 2) + Pr(X = 3) + Pr(X = 4) && (9)\\
&= 2k + 2k + k && (10)\\
&= 5k && (11)\\
&= 5 \times 0.15 && (12)\\
&= 0.75 && (13)
\end{aligned}
$$

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

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

$$Pr(B) = Pr(X = 2) \tag{14}$$
$$= 2k \tag{15}$$
$$= 2 \times 0.15 \tag{16}$$
$$= 0.30 \tag{17}$$

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

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

$$
\begin{aligned}
Pr(C) &= Pr(X \leq 2) && (18)\\
&= Pr(X = 0) + Pr(X = 1) + Pr(X = 2) && (19)\\
&= 0.1 + k + 2k && (20)\\
&= 0.1 + 3k && (21)\\
&= 0.1 + 3 \times 0.15 && (22)\\
&= 0.1 + 0.45 && (23)\\
&= 0.55 && (24)
\end{aligned}
$$

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