Assignment 4

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Outline

Exercise 13.3.5

The random variable X has a probability distribution P(X) of the following form, where k is some number:

$\Pr(X=0)$	$\Pr(X=0)$	$\Pr(X=0)$	$\Pr(X=0)$
k	2k	3k	0

Table 1: Probability Distribution

(a) Determine the value of k.
(b) Find $\Pr(X < 2)$, $\Pr(X \leq 2)$ and $\Pr(X \geq 2)$.

Solution(a)

Given a Random Variable X with its probability distribution.

(a) As we know the sum of all the probabilities in a probability distribution of a random variable must be one. i.e.,

$$\sum_{k=1}^{n} \Pr(X = k) = 1 \tag{1}$$

Solution (a)

Hence, by using (1) the sum of probabilities of given table:

$$\implies 1 = k + 2k + 3k + 0$$
$$\implies 1 = 6k$$
$$k = \frac{1}{6}$$

Solution (b)

(b) (i) Now we have to find $\Pr(X < 2)$

$$\Pr(X < 2) = \Pr(X = 0) + \Pr(X = 1)$$
$$= k + 2k$$
$$= 3k$$
$$\therefore \Pr(X < 2) = 3 \times \frac{1}{6} = \frac{1}{2}$$

Solution (b)

(ii) Now we have to find $\Pr\left(X \leq 2\right)$

$$\Pr\left(X \leq 2\right) = \Pr\left(X = 0\right) + \Pr\left(X = 1\right) + \Pr\left(X < 2\right)$$
$$= k + 2k + 3k$$
$$= 6k$$
$$\therefore \Pr\left(X \leq 2\right) = 6 \times \frac{1}{6} = 1$$

Solution (b)

(iii) Now we have to find $\Pr(X \geq 2)$

$$\Pr(X \geq 2) = \Pr(X = 2) + \Pr(X > 2)$$
$$= 3k + 0$$
$$= 3k.$$
$$\therefore \Pr(X \geq 2) = 3 \times \frac{1}{6} = \frac{1}{2}.$$