K19FG-4-FEB

Thursday, February 04, 2021
9:00 AM

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(iv) $P(X \le a) > \frac{1}{2}$

$\Rightarrow \boxed{a = 4}$ Ans

$X = x$	$p(x)$	$F(x) = P(X \le x)$
0	0	0
1	$\frac{1}{10}$	$\frac{1}{10}$
2	$\frac{2}{10}$	$\frac{3}{10}$
3	$\frac{2}{10}$	$\frac{5}{10} = \frac{1}{2}$
4	$\frac{3}{10}$	$\frac{8}{10} > \frac{1}{2}$
5	$\frac{1}{100}$	
6	$\frac{2}{100}$	
7	$\frac{17}{100}$	

Que :- Find $F(5) = P(X \le 5)$

Que :- If $p(x) = \begin{cases} \frac{x}{15}, & x = 1, 2, 3, 4, 5 \\ 0 & \text{otherwise} \end{cases}$

(i) $P(X = 1 \text{ or } X = 2)$ (ii) $P\left(\frac{1}{2} < X < \frac{5}{2} \middle| X > 1\right)$

Soln :- $p(1) = \frac{1}{15}$, $p(2) = \frac{2}{15}$, $p(3) = \frac{3}{15}$, $p(4) = \frac{4}{15}$

and $p(5) = \frac{5}{15}$

$\Rightarrow P(X = 1 \text{ or } X = 2) = P(X = 1 \cup X = 2)$

$$= P(X=1) + P(X=2) - P(X=1 \cap X=2)$$

$$= \frac{1}{15} + \frac{2}{15} - P(\phi)$$

$$= \frac{3}{15} = \frac{1}{5} \text{ Ans}$$

(ii) $$P\left(\frac{1}{2} < X < \frac{5}{2} \,\middle|\, X > 1\right) = \frac{P\left(\frac{1}{2} < X < \frac{5}{2} \cap X > 1\right)}{P(X>1)}$$

$$= \frac{P(\{1,2\} \cap \{2,3,4,5\})}{P(X>1)}$$

$$= \frac{P(X=2)}{P(X>1)} = \frac{\frac{2}{15}}{1 - P(X \le 1)}$$

$$= \frac{\frac{2}{15}}{1 - \frac{1}{15}}$$

$$= \frac{\frac{2}{15}}{14/15}$$

$$\frac{1}{7} \text{ Ans}$$

Continuous Random variable :-

A r.v. is called continuous r.v. if its values can not be one-one onto mapping from set of positive integer.

Eg :- Hiegth, Mass, length, $[a,b]$, (a,b), $[a,b)$, $(a,b]$

Note :- For continuous R.V. the probability function is called probability Density function (pdf)

Probability density Function (pdf) :-

Let X denotes the r.v. then pdf of r.v. X is defined by
$$f(x) = f_X(x) = \lim_{\delta x \to 0} \frac{P(x \le X \le x+\delta x)}{\delta x}$$

Note :- The Probability Function of continuous r.v. is defined between two points α and β as such
$$P(\alpha \le X \le \beta) = \int_{\alpha}^{\beta} f(x)\, dx$$

Note :- Let $f(x)$ the pdf is defined on $(-\infty, \infty)$ then

(i) $f(x) \geq 0$

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(ii) $\int_{-\infty}^{\infty} f(x)\, dx = 1$

(iii) For any event $E \Rightarrow P(E) = \int_E f(x)\, dx$