

SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)



DEPARTMENT OF MATHEMATICS

RANDOM VARIABLES

by the outcome of a random experiment is called a random variable.

a coin. Consider the random variable which is the number of heads (0,1 or 2).

Outcome : HH HT TH TT

Value of x : 2 1 1 0

Types of random Variables:

There are two types of random variables:

- 1. Discrete random variable
- 2 Continuous random Variable.

Discrete random Variable:

A random Variable which can assume only a Countable number of real Values is called a discrete random Variable.

Examples :

- 1. Number of telephone calls per unit time
- 2. Marks obtained in a test.

Distribution function (or) Cumulative Distribution function of the random variable X:

The C.D.F of a random variable x is defined

as,

 $F(\alpha) = P(x \leq \alpha) = \sum_{x_i \leq \alpha} P(x_i)$

in (-0,0)





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PROBLEMS :

(1) Find the Constant 'k' from the following probability distribution of a discrete random variable X.

Values of $X = x$	1	2	3	4	5	Total
p(x)	0.1	0.2	K	аĸ	0.1	1

Solution: We know that,

$$\sum_{i=1}^{\infty} p(x_i) = 1$$

$$\sum_{i=1}^{5} p(x_i) = 1$$

$$p(1) + p(2) + p(3) + p(4) + p(5) = 1$$

$$0.1 + 0.2 + k + 2k + 0.1 = 1$$

$$3k + 0.4 = 1$$

$$3k = 1 - 0.4 = 0.6$$

$$3k = 0.6$$

$$k = 0.6$$

$$k = 0.6$$

$$3k = 0.2$$

- (2) For the following probability distribution,
 - (i) Find the distribution function of X,
 - (ii) What is the Smallest Value of 'x' for which $P(x \le x) > 0.5$

Solution:

(i) The distribution function of X is given by,

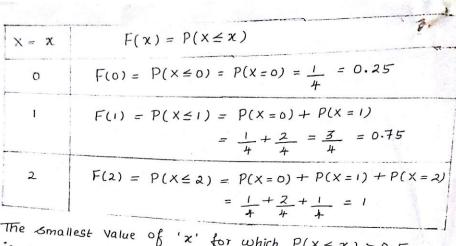




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(ii) The Smallest Value of 'x' for which P(x = x) > 0.5

A random variable 'X' has the following probability function X = xP(x) ak 2K2

(i) Find k (ii) Evaluate P(x < b), $P(x \ge 6)$ and P(0 < x < 5)(iii) If $P(X \le K) > \frac{1}{2}$, find the minimum value of K and

determine the distribution function of X.

Solution:

(i) We know that, $\sum_{i=1}^{\infty} p(x_i) = 1$ > p(x;) = 1

 $p(0) + p(1) + p(2) + \dots + p(7) =$ 0+ K+ QK+ QK+ 3K + K2 + QK2+ TK2+ K = 1





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$$10 k^{2} + 9k - 1 = 0$$

$$k = -9 \pm \sqrt{81 + 40} \qquad b \pm \sqrt{6^{2} - 40} \qquad a = 10$$

$$= -9 \pm \sqrt{121} = -9 \pm 11 \qquad = -9 + 11 \qquad (51) = -9 - 11$$

$$= 20 \qquad = -9 + 11 \qquad = -9 + 11 \qquad (51) = -9 - 11 \qquad (52) = -9 - 11 \qquad (52) = -9 - 11 \qquad (53) = -9 - 11 \qquad (54) = -9 - 1$$

$$\therefore k = \frac{\lambda}{20}, \frac{-20}{20}$$

$$K = \frac{1}{10}$$
 or $K = -1$

K = -1 is not possible, Since probability cannot be a

negative Value.

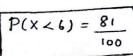
$$K = \frac{1}{10}$$

subs $K = \frac{1}{10}$ in the given table,

(ii)
$$P(X \ge 6) = P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3) + P(X = 4) + P(X = 5)$$

$$= 0 + \frac{1}{10} + \frac{2}{10} + \frac{2}{10} + \frac{3}{10} + \frac{1}{100}$$

$$= \frac{10 + 20 + 20 + 30 + 1}{100}$$







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$$P(x \ge b) = 1 - P(x \ge b)$$

$$= 1 - \frac{81}{100} = \frac{100 - 81}{100}$$

$$P(x \ge b) = \frac{19}{100}$$

$$P(0 \le x \le 5) = P(x = 1) + P(x = 2) + P(x = 3) + P(x = 4)$$

$$= \frac{1}{10} + \frac{2}{10} + \frac{2}{10} + \frac{3}{10}$$

$$= \frac{8}{10} = \frac{4}{5}$$

$$P(0 \le x \le 5) = \frac{14}{5}$$

$$P(0 \le x \le 5) = \frac{14}{5}$$

$$P(x \le 4) = \frac{1}{5}$$

$$P(x = 4) = \frac$$





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