Discrete Random Variables

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1. The probability function of a discrete random variable X is given by

$$p(x) = kx^2 \qquad x = 1, 2, 3$$

where k is a positive constant.

(a) Show that $k = \frac{1}{14}$

(2)

Find

(b) $P(X \geqslant 2)$

(2)

(c) $E(X)$

(2)

(d) $\text{Var}(1 - X)$

(4)

Leave blank

2. The discrete random variable X has probability function

$$P(X = x) = \begin{cases} a(3-x) & x = 0,1,2 \\ b & x = 3 \end{cases}$$

(a) Find $P(X = 2)$ and complete the table below.

x	0	1	2	3
$P(X = x)$	$3a$	$2a$		b

(1)

Given that $E(X) = 1.6$

(b) Find the value of a and the value of b.

(5)

Find

(c) $P(0.5 < X < 3)$,

(2)

(d) $E(3X - 2)$.

(2)

(e) Show that the $Var(X) = 1.64$

(3)

(f) Calculate $Var(3X - 2)$.

(2)

Leave blank

3. The discrete random variable X has probability distribution given by

x	-1	0	1	2	3
$\mathrm{P}(X = x)$	$\frac{1}{5}$	a	$\frac{1}{10}$	a	$\frac{1}{5}$

where a is a constant.

(a) Find the value of a.

(2)

(b) Write down $\mathrm{E}(X)$.

(1)

(c) Find $\mathrm{Var}(X)$.

(3)

The random variable $Y = 6 - 2X$

(d) Find $\mathrm{Var}(Y)$.

(2)

(e) Calculate $\mathrm{P}(X \geqslant Y)$.

(3)

Leave blank

4. When Rohit plays a game, the number of points he receives is given by the discrete random variable X with the following probability distribution.

x	0	1	2	3
$P(X = x)$	0.4	0.3	0.2	0.1

(a) Find $E(X)$.

(2)

(b) Find $F(1.5)$.

(2)

(c) Show that $Var(X) = 1$

(4)

(d) Find $Var(5 - 3X)$.

(2)

Rohit can win a prize if the total number of points he has scored after 5 games is at least 10. After 3 games he has a total of 6 points.
You may assume that games are independent.

(e) Find the probability that Rohit wins the prize.

(6)