

## Question 12.13.3.10

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10. A discrete random variable X has the probability distribution given as below:

X	0.5	1	1.5	2
P(X)	$k$	$k^2$	$2k^2$	$k$

1. Find the value of  $k$
2. Determine the mean of the distribution

**Solution:**

1. We know,

$$\sum_{k \in \{0.5, 1, 1.5, 2\}} p_X(k) = 1 \quad (1)$$

$$k + k^2 + 2k^2 + k = 1 \quad (2)$$

$$3k^2 + 2k - 1 = 0 \quad (3)$$

$$(3k - 1)(k + 1) = 0 \quad (4)$$

$$\text{As probability cannot be negative,} \quad (5)$$

$$k = \frac{1}{3} \quad (6)$$

- 2.

$$\text{Mean of the distribution}(\mu) = E(X) = \sum_{k \in \{0.5, 1, 1.5, 2\}} kp_X(k) \quad (7)$$

$$= 0.5(k) + 1(k^2) + 1.5(2k^2) + 2k \quad (8)$$

$$= 4k^2 + 2.5k \quad (9)$$

$$= (4)\frac{1}{9} + (2.5)\frac{1}{3} \quad (10)$$

$$= \frac{23}{18} \quad (11)$$