

Answer on Question #68039 - Math - Statistics and Probability

Question

Let X has the discrete uniform distribution $f(x) = \frac{1}{k}$ for $x = 0, 1, 2, \dots$, find the expression for its mean u .

Solution

In probability theory and statistics by **discrete uniform distribution** we denote a probability distribution whereby a finite number of values are equally likely to be observed; every one of k values has equal probability $1/k$.

Therefore, the given distribution is the discrete uniform distribution, if we write

$$f(x) = \frac{1}{k} \text{ for } x = 0, 1, 2, \dots, k - 1.$$

Then its mean is equal to

$$u = 0 \cdot \frac{1}{k} + 1 \cdot \frac{1}{k} + 2 \cdot \frac{1}{k} + \dots + (k - 1) \cdot \frac{1}{k} = \frac{1}{k} \cdot (0 + 1 + 2 + \dots + k - 1).$$

In brackets we have a sum of arithmetic sequence. Therefore,

$$u = \frac{1}{k} \cdot \frac{(0 + k - 1) \cdot k}{2} = \frac{k - 1}{2}.$$

Answer: $u = \frac{k-1}{2}$.