

AI1103

Assignment 1

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Download Python code and Latex from below links :
[https://github.com/KRISHNASAI1105 /demo/tree/main/Assignment1](https://github.com/KRISHNASAI1105/demo/tree/main/Assignment1)

Problem number 5.15

State which of the following are not the probability distributions of a random variable. Give reasons for your answer.

i)

X	0	1	2
P(X)	0.4	0.4	0.2

ii)

X	0	1	2	3	4
P(X)	0.1	0.5	0.2	-0.1	0.3

iii)

X	-1	0	1
P(X)	0.6	0.1	0.2

iv)

X	3	2	1	0	-1
P(X)	0.3	0.2	0.4	0.1	0.05

Solution

Consider an experiment, whose sample space is S . For each event E of the sample space S , we assume that a number $P(E)$ is defined according to the following two axioms - We refer to $P(E)$ as the probability of the event E .

Axiom 1:

$$0 \leq P(E) \leq 1 \quad (0.0.1)$$

It states that the probability of the outcome of given experiment must lie in between 0 and 1.

Axiom 2:

$$P(S) = 1 \quad (0.0.2)$$

It states that with probability 1, the outcome will be a point in the sample space S .

From i)

The sum of given probabilities = $0.4 + 0.4 + 0.2 = 1$.

Thus X is a probability distribution.

From ii)

There is a negative probability -0.1 for $X = 3$. Thus X is NOT a probability distribution.

From iii)

The sum of given probabilities = $0.6 + 0.1 + 0.2 = 0.9$.

The summation of given probabilities is not equal to 1.

Thus X is NOT a valid probability distribution.

From iv)

The sum of given probabilities = $0.3 + 0.2 + 0.4 + 0.1 + 0.05 = 1.05$.

The summation of given probabilities is not equal to 1.

Thus X is NOT a valid probability distribution.