Assignment 1

AI1110: Probability and Random Variables
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12.13.4.1: Question.State which of the following are not the probability distributions of a random variable:

A.

X	0	1	2
P(x)	0.4	0.4	0.2

B.

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

C.

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

D.

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

Solution:

Answer(A):

As we know the sum of all probabilities of a probability distribution must be one. i.e.,

$$\sum_{i=1}^{n} p_i = 1 \tag{1}$$

Hence the sum of probabilities of the given table=0.4+0.4+0.2=1

$$\sum_{i=1}^{3} p_i = 0.4 + 0.4 + 0.2 = 1$$

Hence the given table is probability distributions of a random variable.

Answer(B):

As we know the sum of all probabilities of a probability distribution must be one. i.e.,

$$\sum_{i=1}^{n} p_i = 1 \tag{2}$$

But P(X)=-0.1 for X=3 As probability of any observation must be positive.

Hence the given table is not probability distributions of a random variable.

Answer(C):

As we know the sum of all probabilities of a probability distribution must be one. i.e.,

$$\sum_{i=1}^{3} p_i = 0.6 + 0.1 + 0.2 + 0.9$$

The sum of probabilities of the given table is not equal to 1.
Hence the given table is not probability distributions of a random variable.

Answer(D):

$$\sum_{i=1}^{5} p_i = 0.3 + 0.2 + 0.4 + 0.1 + 0.05 = 1.05$$

The sum of probabilities of the given table is greater than 1.
Hence the given table is not the probability distributions of a random variable.