Is the given probability distribution valid?

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The question of "Is the given probability distribution valid?" refers to determining if the assigned probabilities for a set of events are reasonable and adhere to the basic principles of probability theory. A valid probability distribution should have non-negative probabilities that sum up to 1, representing all possible outcomes of the events. It is essential to check the validity of a probability distribution to ensure accurate and reliable calculations and analyses based on it. Factors such as sample size, data collection methods, and potential biases should be considered when evaluating the validity of a probability distribution.

Determine if a Probability Distribution is Valid

A probability distribution tells us the probability that a takes on certain values.

In order for a probability distribution to be valid, it must meet two requirements:

1. Each probability must be between 0 and 1.

2. The sum of the probabilities must add up to 1.

If both of these requirements are met, then the probability distribution is valid.

The following examples show how to check if different probability distributions are valid.

Example 1: Goals Scored in a Soccer Game

The following probability distribution shows the

probability of a certain soccer team scoring a certain number of goals in a game:

Goals (X)	Probability P(X)
0	0.18
1	0.34
2	0.35
3	0.11
4	0.02

Let's check if this probability distribution meets the two requirements to be valid:

1. Each probability must be between 0 and 1.

We can see that each individual probability is between 0 and 1.

2. The sum of the probabilities must add up to 1.

We can see that the sum of the probabilities adds up to 1:

Sum = .18 + .34 + .35 + .11 + .02 = 1

Both requirements are met so this probability

distribution is valid.

Example 2: Sales Made in a Month

Sales (X)	Probability P(X)
10	0.44
20	0.31
30	0.39
40	0.06

Let's check if this probability distribution meets the two requirements to be valid:

1. Each probability must be between 0 and 1.

We can see that each individual probability is between 0 and 1.

2. The sum of the probabilities must add up to 1.

We can see that the sum of the probabilities does not add up to 1:

Sum = .44 + .31 + .39 + .06 = 1.2

Both requirements are not met so this probability distribution is not valid.

Example 3: Number of Battery Failures

The following probability distribution tells us the probability that a given vehicle experiences a certain number of battery failures during a 10-year span:

Failures (X)	Probability P(X)
0	0.24
1	0.57
2	0.22
3	-0.03

Let's check if this probability distribution meets the two requirements to be valid:

1. Each probability must be between 0 and 1.

We can see that each individual probability is not between 0 and 1.

The last probability in the table is a negative value.

2. The sum of the probabilities must add up to 1.

We can see that the sum of the probabilities does add up to 1:

Sum = .24 + .57 + .22 - .03 = 1

Both requirements are not met so this probability distribution is not valid.

The following tutorials provide additional information about probability distributions: