What is a Probability Distribution Table? (Definition & Example)

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A probability distribution table is a table that displays the possible outcomes of an event, along with the associated probabilities of those outcomes occurring. It provides a clear and organized representation of the likelihood of different outcomes in a given situation. For example, a coin toss probability distribution table would show the possible outcomes (heads or tails) and the probabilities associated with each outcome (50% for heads, 50% for tails). This allows for a better understanding and prediction of the potential outcomes of an event. Probability distribution tables are commonly used in statistics, mathematics, and various fields of study to analyze data and make informed decisions.

What is a Probability Distribution Table? (Definition & Example)

A probability distribution table is a table that displays the probability that a takes on certain values.

For example, the following probability distribution table tells us the probability that a certain soccer team scores a certain number of goals in a given game:

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

The left-hand column shows the number of goals and the right-hand column tells us the probability that the

team will score this number of goals.

For example:

The probability that the team scores exactly 0 goals is 0.18.The probability that the team scores exactly 1 goal is 0.34.The probability that the team scores exactly 2 goals is 0.35.

And so on.

Properties of a Probability Distribution Table

A probability distribution table has the following properties:

1. All probabilities must add up to 1.

For a probability distribution table to be valid, all of the individual probabilities must add up to 1. We can verify that the previous probability distribution table is valid:

Sum of probabilities = 0.18 + 0.34 + 0.35 + 0.11 + 0.02 = 1.

2. The mean can be calculated.

The formula to calculate the mean of a given probability distribution table is:

$\mu = \Sigma x * P(x)$

where:

x: Data valueP(x): Probability of value

Goals (X)	Probability P(X)
0	0.18
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3	0.11
4	0.02

The mean number of goals for the soccer team would be calculated as:

μ = 0*0.18 + 1*0.34 + 2*0.35 + 3*0.11 + 4*0.02 = 1.45 goals.

3. The standard deviation can be calculated.

The formula to calculate the standard deviation of a given probability distribution table is:

$\sigma = \sqrt{\Sigma(xi-\mu)2 * P(xi)}$

where:

xi: The ith valueμ: The mean of the distributionP(xi): The probability of the ith value

For example, here's how to calculate the standard deviation of goals scored by the soccer team:

Goals (X)	Probability P(X)	$(x_i-\mu)^2 * P(x_i)$
0	0.18	$(0-1.45)^2*0.18 = .3785$
1	0.34	$(1-1.45)^2*0.34 = .0689$
2	0.35	$(2-1.45)^2*0.35 = .1059$
3	0.11	$(3-1.45)^2*0.11 = .2643$
4	0.02	$(4-1.45)^2*0.02 = .1301$

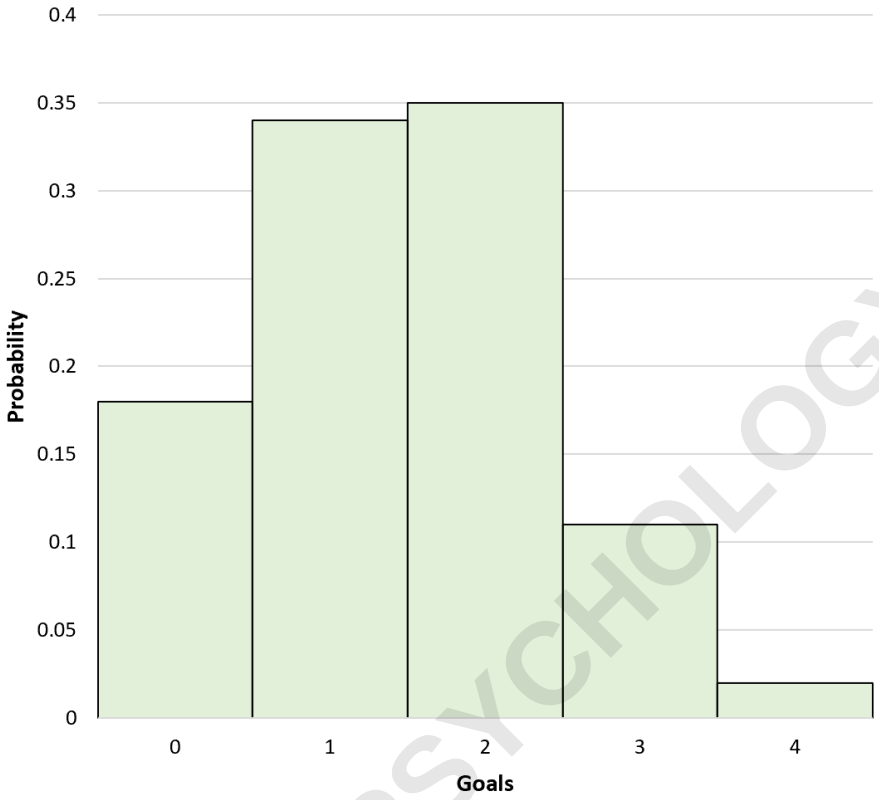
The standard deviation is the square root of the sum of the values in the third column:

Standard deviation = $\sqrt{}$(.3785 + .0689 + .1059 + .2643 + .1301) = 0.9734

How to Visualize a Probability Distribution Table

The easiest way to visualize the values in a probability distribution table is by using a histogram, which

displays the values of the random variable along the x-axis and the probability of those values along the y-axis:



This lets us quickly visualize the probability values from the table.

In particular, we can see that there is a high probability that the team scores 2 goals or less while there is a tiny probability that the team scores as many as 4 goals.