A uniform distribution is a probability distribution in statistics in which the likelihood of each outcome is the same. Put differently, there is an equal chance of occurrence for every value falling within a given range.

For instance, since the width of the range is 10 - 0 = 10, if you have a uniform distribution on the interval [0, 10], the probability of choosing any value between 0 and 10 is 1/10. In a similar vein, the probability of choosing any value between 3 and 7 is likewise 1/10 if the interval is [3, 7]. There are no peaks or troughs in a uniform distribution's probability distribution, and each value within the interval has an equal chance of happening.

For Bayesian inference, in situations when we lack precise prior knowledge about a parameter's value, we employ the uniform distribution as a prior. This distribution shows how likely we think all values are within a given range. We utilize it in three phases:

Selecting the prior: In the event that we don't know anything beforehand, we choose a uniform prior distribution, which says that every value falling inside a given range is equally likely.

Data updating: Using the observed data, we apply the Bayes theorem to update our prior belief and derive the posterior distribution, which represents our revised knowledge of the parameter.

Drawing conclusions: We can estimate the parameter's value or identify any associated uncertainty by using the posterior distribution to make judgments about it.

In general, Bayesian inference uses the uniform distribution to convey uncertainty and incomplete prior knowledge.