

What is a Unimodal Distribution? (Definition & Example)

Authored by
stats writer

April 25, 2024

RECOMMENDED CITATION

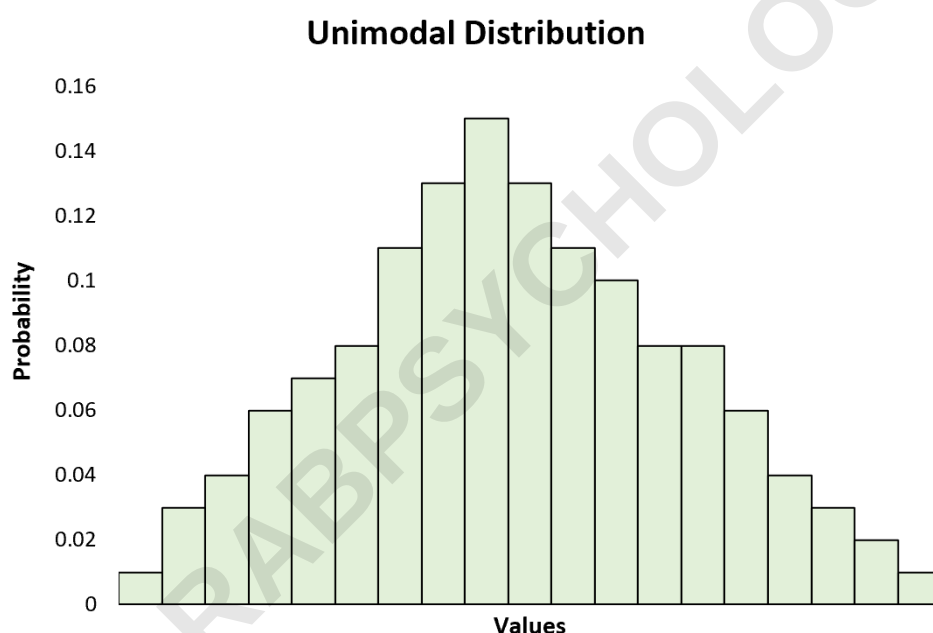
stats writer (2024). *What is a Unimodal Distribution? (Definition & Example)*.

PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=139222>

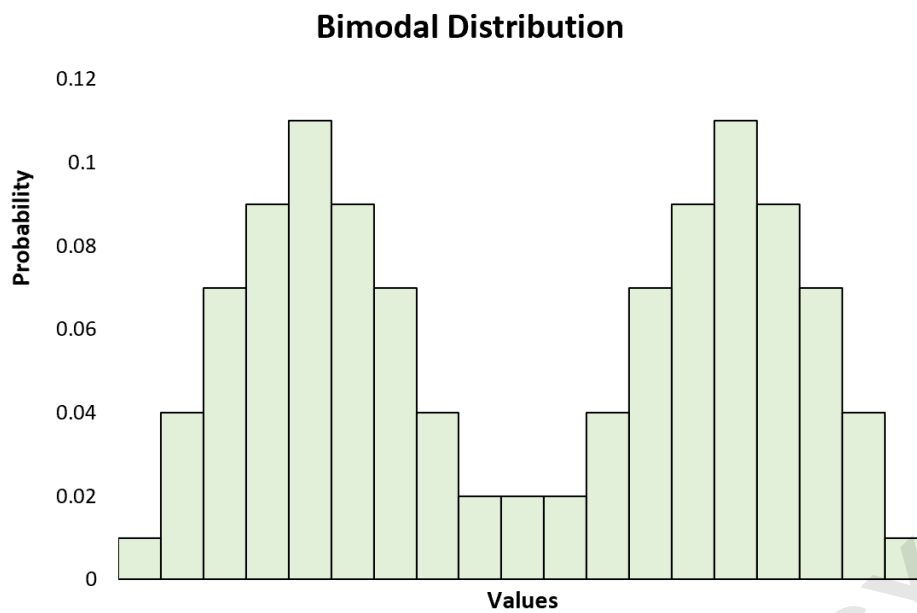
A unimodal distribution is a type of statistical distribution that is characterized by having a single peak or mode. This means that the data in the distribution is mostly concentrated around a central value, with decreasing frequency as the values move away from the mode. Examples of unimodal distributions include the normal distribution, the exponential distribution, and the Chi-square distribution. It is commonly used in statistical analysis and can provide valuable insights into the overall shape and characteristics of a dataset.

What is a Unimodal Distribution? (Definition & Example)

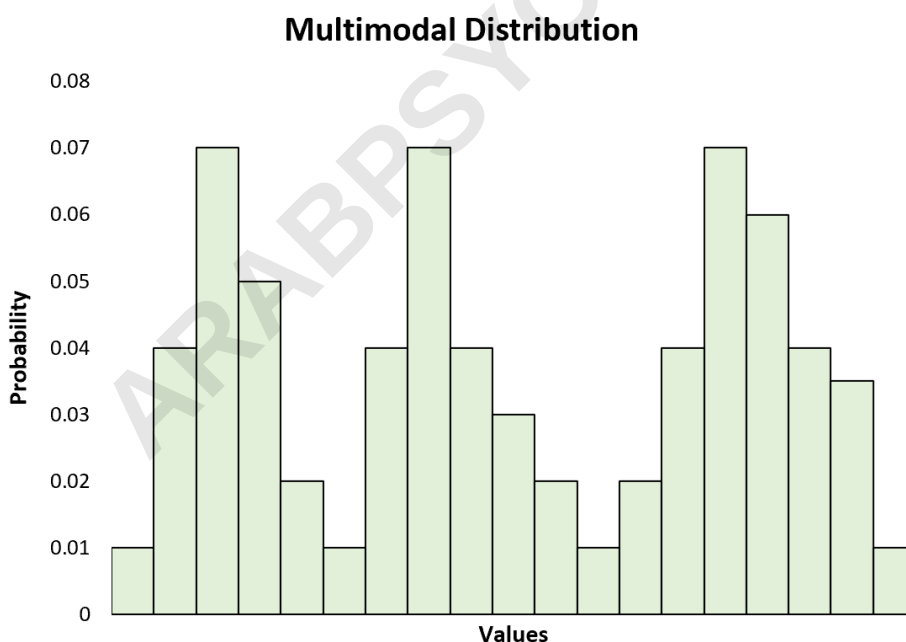
A unimodal distribution is a probability distribution with one clear peak.



This is in contrast to a , which has two clear peaks:



This is also in contrast to a , which has two or more peaks:



Note: A bimodal distribution is just a specific type of

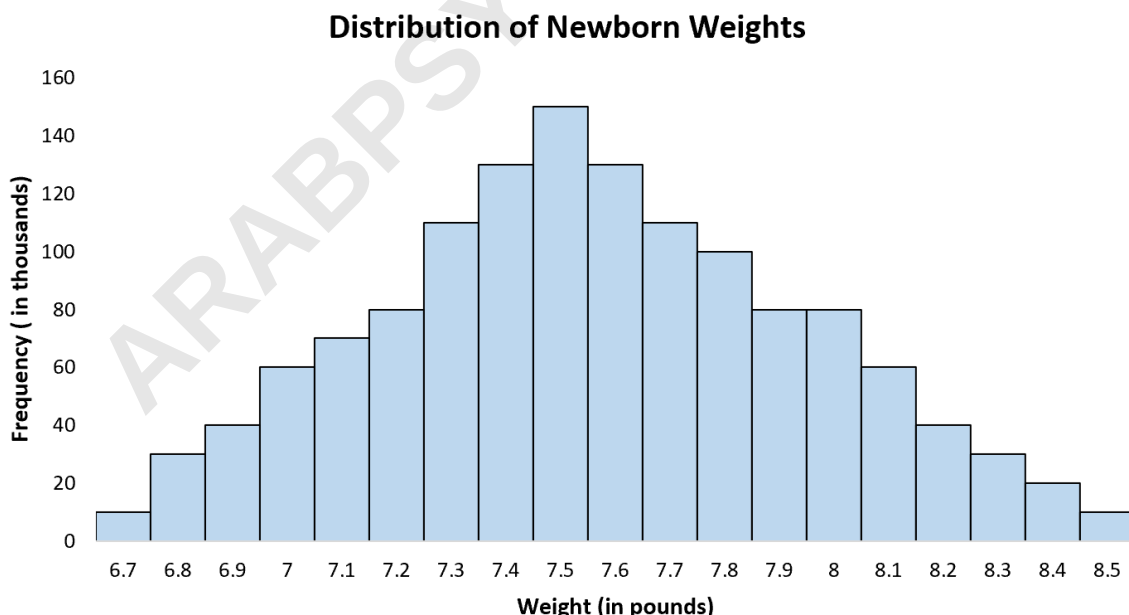
multimodal distribution.

Examples of Unimodal Distributions

Here are a few examples of unimodal distributions in practice.

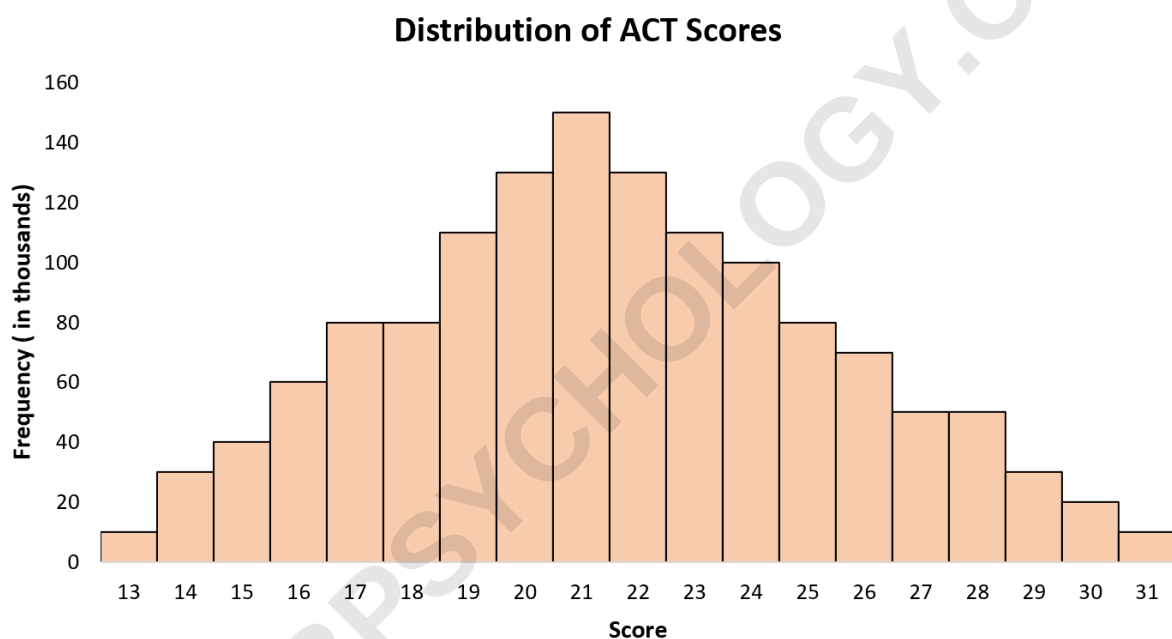
Example 1: Birthweight of Babies

It's well known that the distribution of the weights of newborn babies follows a unimodal distribution with an average around 7.5 lbs. If we create a histogram of baby weights, we'll see a "peak" at 7.5 lbs with some babies weighing more and some weighing less.



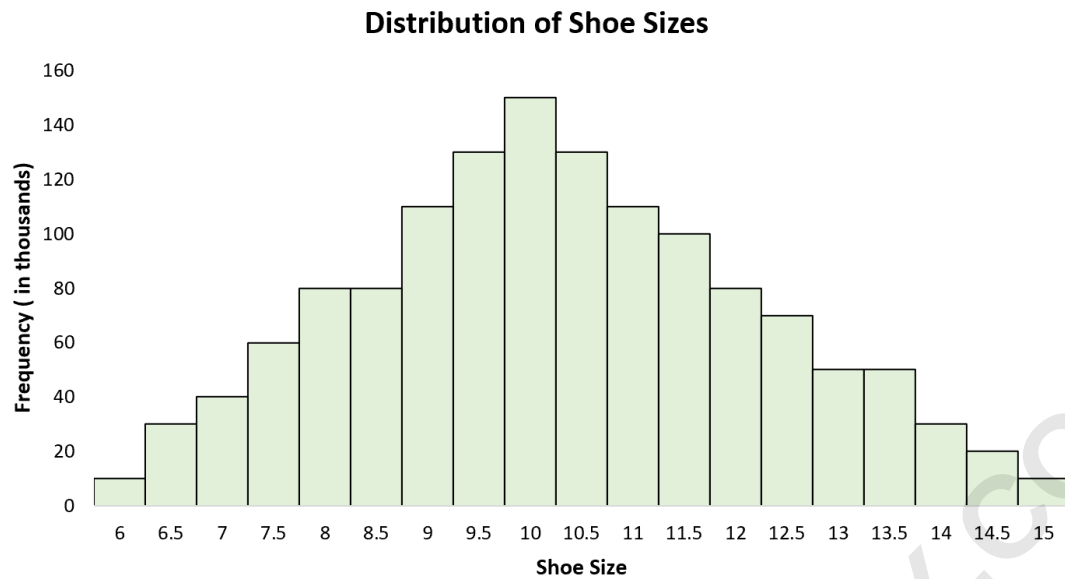
Example 2: ACT Scores

The average ACT score for high school students in the U.S. is about a 21 with some students scoring less and some scoring higher. If we create a histogram of ACT scores for all students in the U.S. we'll see a single "peak" at 21 with some students scoring higher and some scoring lower.



Example 3: Shoe Sizes

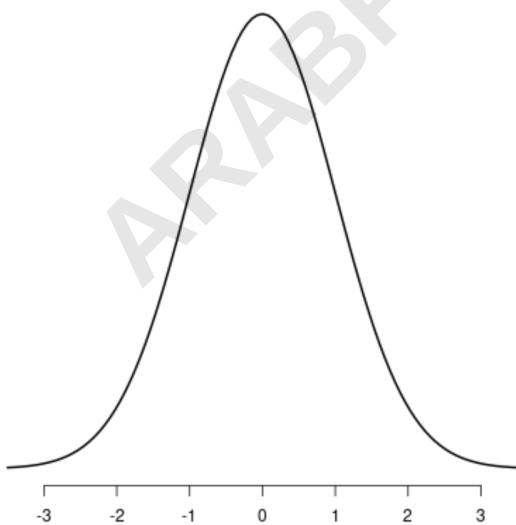
The distribution of men's shoe sizes is a unimodal distribution with a "peak" around 10. If we create a histogram of all shoe sizes for men, we'll see a single peak at 10 with some men wearing a larger size and some wearing a smaller size.



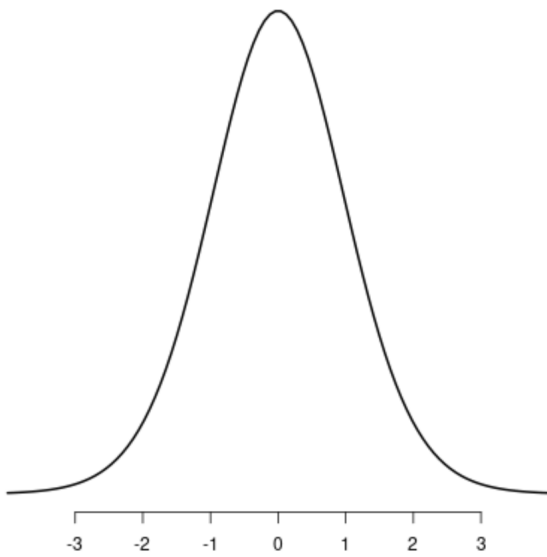
Unimodal Distributions in Statistics

The following probability distributions in statistics are all unimodal distributions:

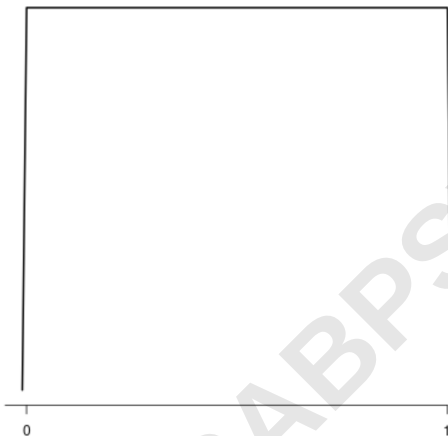
The Normal Distribution



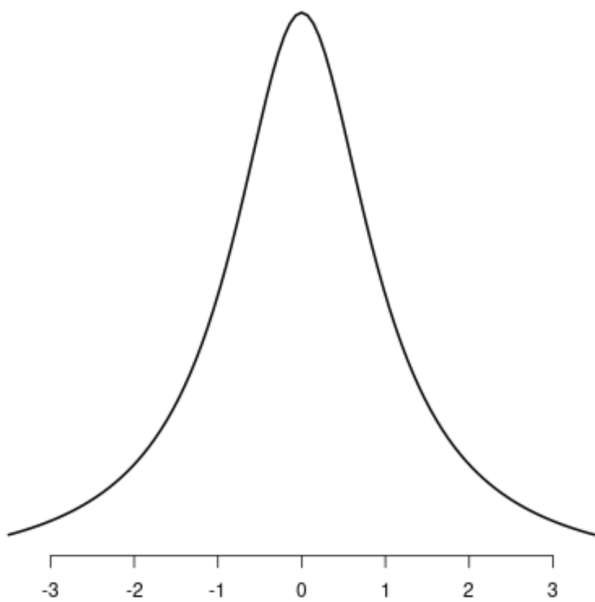
The t-Distribution



The Uniform Distribution



The Cauchy Distribution



Notice that each of these distributions has a single distinct peak.

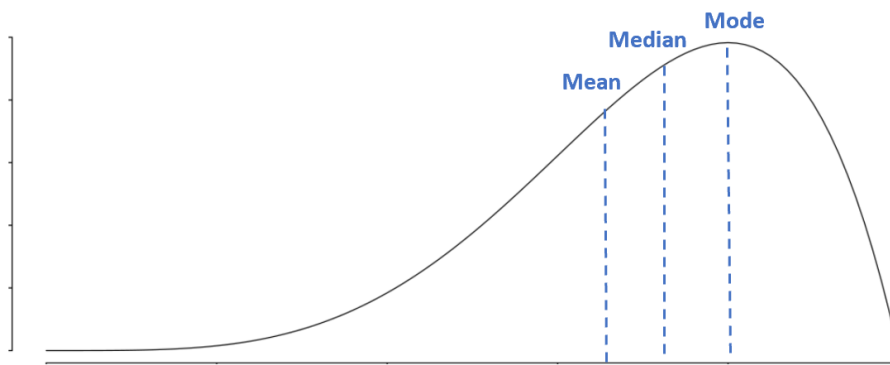
How to Analyze Unimodal Distributions

We often describe unimodal distributions using three different :

Mean: The average value
Median: The middle value
Mode: The value that occurs most often

Depending on how the distribution is, these three metrics can be in different places.

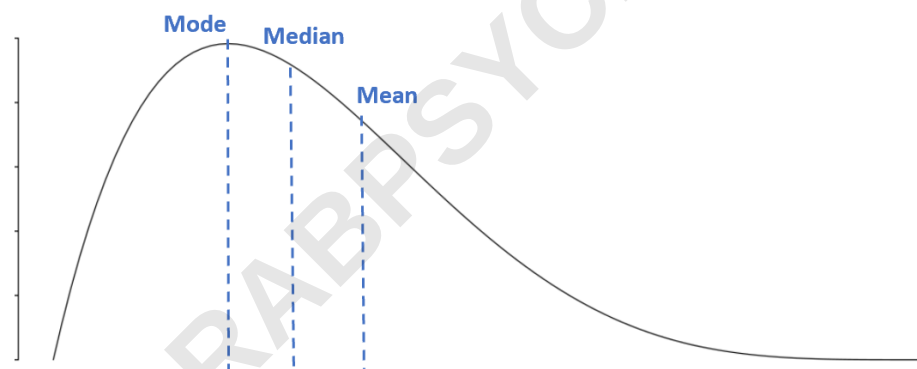
Left Skewed Distribution: $\text{Mean} < \text{Median} < \text{Mode}$



Left Skewed Distribution

In a left skewed distribution, the mean is less than the median.

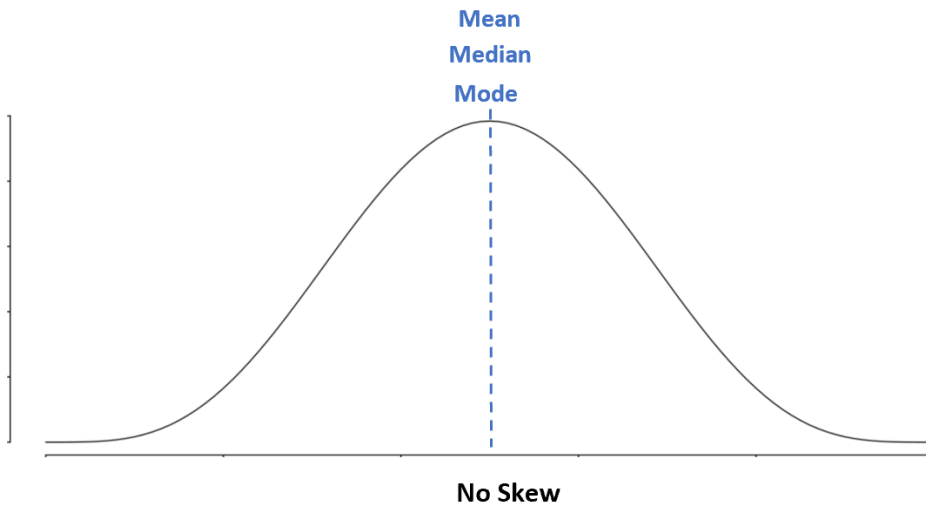
Right Skewed Distribution: $\text{Mode} < \text{Median} < \text{Mean}$



Right Skewed Distribution

In a right skewed distribution, the mean is greater than the median.

No Skew: $\text{Mean} = \text{Median} = \text{Mode}$



In a symmetrical distribution, the mean, median, and mode are all equal.