

# Statistics Laminate Reference Chart: Parameters, Variables, Intervals, Proportions (Quickstudy: Academic )

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REF01070-Academic Outline

STATISTICS

THE BASIC PRINCIPLES OF STATISTICS FOR INTRODUCTORY COURSES

**BASIC DEFINITIONS**

**STATISTICS:** The study of methods for collecting, organizing, and analyzing data.

**STATISTICAL DISTRIBUTION:** Frequency distribution and present data in a context and summarizes basic information about a sample or population.

**PARAMETER:** Descriptive measure computed for a population on the basis of samples.

**POPULATION:** The collection of actual or potential elements about which inferences are made.

**SAMPLE:** A subset of the population selected using some sampling method.

**Sampling methods:**

- Cluster sample:** A population is divided into groups called clusters; some clusters are randomly selected, and every member in them is observed.
- Stratified sample:** The population is divided into strata, and a simple random sample of elements of each stratum are selected for the sample.
- Simple random sample:** A sample selected so that each possible sample of the same size has an equal probability of being selected; used for most elementary inference.

**VARIABLE:** An attribute or feature of a population or sample that can be measured (e.g., height, weight, IQ, hair color) and can take on some of the many variables that can be measured for people.

**DATA:** Values of variables that have been collected.

**Types of data:**

- Qualitative (or "categorical") data:** are descriptive but not numeric, e.g., your gender, your birthplace, the color of gas automobile.
- Quantitative data:** numeric values.
- Discrete data:** take counting values (0, 1, 2, ...), just values, usually representing things that can be counted, e.g., the number of teeth or a dog, the number of times a professor is late to a lecture.
- Continuous data:** can take a range of numeric values, not just counting values, e.g., the height of a person, the weight of a bag of beans, the amount of time a person is late.

**Levels of measurement:**

- Qualitative data:** can be measured at the Nominal level (values are names, without any order, e.g., color of a car, name in college).
- Ordinal level:** Values have some natural order, e.g., high school class (freshman / sophomore / junior / senior), military rank.
- Quantitative data:** can be measured at the Interval level (Nominal data with numerical order, intervals of differences are meaningful), but not ratios, e.g., temperature in Fahrenheit degrees (80° is 20° hotter than 60° but it is not twice as hot).
- Ratio level:** Nominal data for which there is a true zero, both intervals and ratios are meaningful, e.g., weight, length, duration, used physical properties.

**STATISTICS:** A statistic measure computed from sample data, used to describe the sample and to estimate the corresponding population parameter.

**PARAMETER:** A statistic measure that describes a population; parameters are usually computed but are inferred from sample statistics.

**FREQUENCY DISTRIBUTION**

Provides the frequency (number of times observed) of each value of a variable.

**Table 10:** Students in a driving class are polled regarding number of accidents they've had.

| # of accidents | Frequency (Relative Frequency) |        |
|----------------|--------------------------------|--------|
| 0              | 5                              | 0.0526 |
| 1              | 2                              | 0.0151 |
| 2              | 9                              | 0.1579 |
| 3              | 15                             | 0.2652 |
| 4              | 16                             | 0.2807 |
| 5              | 12                             | 0.2116 |

**GROUPED FREQUENCY DISTRIBUTION:**

Values of the variable are grouped into classes.

**Table 11:** The scores on a midterm exam are grouped into classes.

| Score | f  | cumulative freq. |
|-------|----|------------------|
| 90-99 | 4  | 301              |
| 80-89 | 13 | 76               |
| 70-79 | 31 | 48               |
| 60-69 | 19 | 27               |
| 50-59 | 7  | 9                |
| 40-49 | 1  | 1                |

**RELATIVE FREQUENCY DISTRIBUTION:** Each frequency is divided by the total number of observations to produce the proportion or percentage of data for having that value (see third column of Table 11).

**CUMULATIVE FREQUENCY DISTRIBUTION:** Frequencies count all observations of a particular value and all those less. See third column of Table 2.

**MEASURES OF CENTRAL TENDENCY**

**MEAN:** Most commonly used measure of central tendency, usually mean by "average"; measure of central value.

**FREQUENCY MEAN**  $\bar{x} = \frac{1}{N} \sum_{i=1}^N x_i$  **SAMPLE MEAN**  $\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$

**Trimmed mean:** Computed discarding some number of the highest and lowest values. See median for extreme mean.

**Weighted mean:** Computed with a  $\frac{f_i}{N} x_i$  weight multiplied to each value, making those with more values influence the mean more.  $\frac{\sum f_i x_i}{\sum f_i}$

**MEDIAN:** Value that divides the set in the sense that there are as many observations on each side of it; less sensitive to extreme values, for an odd number of observations, it is the middle value; for an even number, it is the average of the two middle values. In Table 11, the median is the average of the 20th and 21st observations, or 1.5.

**MODE:** Descriptive statistic used to find the greatest frequency.

**LEAST-SQUARES STATISTICS**

**MEASURES OF DISPERSION**

**SUM OF SQUARES (SS):** The sum of squared deviations from the mean.

**Population SS:**  $\sum (x_i - \mu)^2$  or  $\sum (x_i - \bar{x})^2$

**Sample SS:**  $\sum (x_i - \bar{x})^2$  or  $\sum (x_i - \bar{x})^2$

**VARIANCE:** The average of square differences between observations and their mean.

**Population variance:**  $\sigma^2 = \frac{1}{N} \sum (x_i - \mu)^2$

**Sample variance:**  $s^2 = \frac{1}{n-1} \sum (x_i - \bar{x})^2$

**STANDARD DEVIATION:** The square root of the variance, smaller variance, it has the same units as the original data and is more commonly used.

**SD:**  $SD = \sqrt{\frac{1}{N} \sum (x_i - \bar{x})^2}$

**STANDARDIZED MEASURE:** Also known as Z-score, the standard score of a value is the absolute number of standard deviations from the mean at which the value is found.  $z = \frac{x - \bar{x}}{SD}$

**z-score:** A positive z-score indicates a value greater than the mean, a negative z-score indicates a value less than the mean; autocorrelation indicates the mean value.

**Computing average value in a data set or distribution:** If autocorrelation considerations over a set of distribution has been standardized, it has a mean  $\mu = 0$  and a new standard deviation  $\sigma = 1$ .

**GRAPHING TECHNIQUES**

**Histogram:** A graph that uses bars to indicate the frequency of occurrence of observations.

**Bar graph:** A bar graph used with qualitative, discrete variables.

**FREQUENCY CURVE:** A graph representing a frequency distribution in the form of a continuous line.

**Frequency curve:** A continuous line that meets a constant value, but in all the lower classes are stacked up in the adjacent higher class, curve has a negative slope.

**Histogram curve:** The frequency curve is arranged in several around the center median "peak".

**Normal curve:** bell-shaped curve symmetric.

**Normal curve (Gaussian):** frequency: frequency curve is divided with a diagonal "tail" to the left (mean) and one to the right (standard deviation).

**NORMAL CURVE**

**LEFT**



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## Synopsis

This guide is a perfect overview for the topics covered in introductory statistics courses.

## Book Information

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## Customer Reviews

The Graduate School I attend has a mandatory requirement- all students must register and pass (with a B or better) Introductory and Advanced Statistics. Intro Statistics was "instructed" by a gentleman who wanted to be anywhere else but the classroom. (Read: Taught myself Intro Stats).

There are many texts that review statistical concepts and provide a step-by-step illustrations of the never-ending list of formulas. Having read a stack of textbooks, not one provides a condensed summary of all the procedural and conceptual explanations. This chart is the "missing link" . If for nothing else, you can use it as a placemat.

I'm currently taking a nasty class in modeling and simulation, with an emphasis on statistical analysis of inputs and outputs. This cheat sheet has been a lifesaver. Its great for doing homework and midterms when I don't want to fish out my book and look through all 700 pages for a formula or t-distribution table. The theories are well-written and straightforward. This has actually helped me understand lecture material that didn't absorb during class. I've used about 3/4 of the items provided in one class alone. I highly recommend this product for anyone taking a similar class.

This is one of the best of the Quick Study guides. It's about as helpful a condensation of the first

semester or two of stat that you'll find. With so many grad programs, from psychology to biology to MBAs requiring at least a semester or two of stat there's a great need for a terrific little primer like this. I've been using the Quick Study guides (now BarCharts) for almost 40 years and they're the best short guides out there. I like the plastic format which won't stain or if it gets dirty you can just wipe it off or clean it with a little soap and water. Many of these, from philosophy to stat to psychology to chemistry, were almost constant companions in college. This one covers basic concepts, formulas, and tests for introductory inferential statistics. It's a great reference and teaching aid for this often confusing area.

I bought this for a college stats class. I did not need that expensive textbook after this. Wish I would have purchased this first. It has examples for everything you use in a college stats class. Homework was never easier and it was handy to have. I resold it to people taking the class after me for 100% of the price because it is easy to use and well worth it. The other student took one look at it and did not try to haggle or anything, just handed me the money and said thanks.

This chart was a lifesaver during my Social Statistics class. I doubt I would have passed the course without it.

If it can be done statistically, it is here. I needed a quick fix to brush up on teaching AP Statistics and this helps greatly.

For a math challenged person as myself, this chart is excellent as a quick resource for statistics when working on a dissertation. Formulas and examples are provided that cover the content of a \$100 book, conveniently hole-punched and laminated for quick reference. I wish it also gave a brief description of how each statistic is used to come to certain conclusions why the measures are used, such as what conclusions can be made in reference to educational measurement. But, for a quick reference guide, it has everything covered in basic statistics and then some (such as ANOVA and linear regression).

I only used the Critical Values of Z and T tables from this little guide and that's it. Nothing else was of value to me, and even those two tables were provided in the textbook (it was just more convenient to refer to this guide than the textbook). The guide doesn't even have the correlation coefficient, or critical values of r, table, which it should have. Anyway, I guess this guide is okay, but

I don't see it being a huge help for a Stats class.

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