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

**STATISTICS**  
THE BASIC PRINCIPLES OF STATISTICS FOR INTRODUCTORY COURSES

**BASIC DEFINITIONS**

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

**Quantitative Statistics:** Procedures used to organize and present data in a consistent and meaningful form.

**Qualitative Statistics:** Procedures employed to arrive at broader conclusions or inferences about populations on the basis of samples.

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

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

- Cluster sampling:** 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 fixed number 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, over the most elementary inference.

**VARIABLE:** An attribute of elements of a population or sample that can be measured (e.g., height, weight, IQ, hair color, and pulse rate) or used as the state variable that can be measured (e.g., people).

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

- Types of data:**
  - Qualitative (or "categorical") data:** are descriptive but not numeric, e.g., your gender, your hair color, the color of an automobile.
  - Quantitative data:** take numeric values.
    - Discrete data:** take counting numbers (0, 1, 2, ...) as values, usually representing things that can be counted, e.g., the number of stars on a flag, the number of letters a professor is late in a lecture.
    - Continuous data:** can take a range of numeric values, not just counting numbers, e.g., the height of a child, the weight of a bag of flour, the amount of time a professor is late.
- Level of measurement:**
  - Qualitative data:** can be measured at the:
    - Nominal level:** values are just names without any order, e.g., color of a car, height 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:** numeric data with no actual zero point, (temperature differences are meaningful), but ratios are not, e.g., temperature in Fahrenheit degrees (80°F is 20°F cooler than 60°F, but it is not 150% as hot).
      - Ratio level:** numeric data for which there is a true zero; both intervals and ratios are meaningful, e.g., weight, length, distance, most physical properties.

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

**PARAMETER:** A numeric measure that describes a population; parameters are usually not computed, but are inferred from sample statistics.

**FREQUENCY DISTRIBUTION**

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

**Table 11:** Students in a driving class are polled regarding number of accidents they've had.

| no. of accidents (classroom) | relative frequency | RF    |
|------------------------------|--------------------|-------|
| 0                            | 3                  | 0.075 |
| 1                            | 4                  | 0.100 |
| 2                            | 9                  | 0.225 |
| 3                            | 15                 | 0.375 |
| 4                            | 16                 | 0.400 |
| 5                            | 12                 | 0.300 |

**GROUPED FREQUENCY DISTRIBUTION:** Values of the variable are grouped into classes.

**Table 12:** The scores on a midterm exam are grouped into classes.

| class | f  | relative freq. |
|-------|----|----------------|
| 50-60 | 4  | 8%             |
| 60-70 | 13 | 26%            |
| 70-79 | 31 | 62%            |
| 80-89 | 19 | 38%            |
| 90-92 | 3  | 6%             |
| 93-95 | 1  | 2%             |

**RELATIVE FREQUENCY DISTRIBUTION:** Each frequency is divided by the total number of observations to produce the proportion or percentage of the data set having that value; see third column of Table 1.

**CUMULATIVE FREQUENCY DISTRIBUTION:** Frequency count of observations at a particular value and below that. See third column of Table 2.

**MEASURES OF DISPERSION**

**MEAN OR SQUARE ROOT:** The size of squared deviations from the mean.

**Population SD:**  $\sigma = \sqrt{\frac{1}{n} \sum (x_i - \mu)^2}$

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

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

**Formulas for grouped data:**

**Population:**  $\sigma^2 = \frac{1}{n} \sum f_j(x_j - \mu)^2$

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

**STANDARD DEVIATION:** The square root of the variance (either variance, if that is more exact, or the original data set, if more commonly used).

See Eq. 4.2:  $\sigma = \sqrt{\frac{1}{n} \sum f_j(x_j - \mu)^2}$

**STANDARD SCORES:** Also known as Z scores, the standard score of a value is the observed number of standard deviations from the mean at which the value is found, that is,  $z = \frac{x - \mu}{\sigma}$ .

A positive z score indicates a value greater than the mean; a negative z score indicates a value less than the mean; a z score of zero indicates the mean value.

A z score of zero value in a data set or distribution is a z score of 0.00, indicating that the mean of the distribution has been standardized, so that a score means  $z=0$ , and a one standard deviation is  $z=1$ .

**MEASURES OF CENTRAL TENDENCY**

**MEAN:** Most commonly used measure of central tendency, usually meant by "average," sensitive to extreme values.

**POPULATION MEAN:**  $\mu = \frac{1}{n} \sum x_i$

**SAMPLE MEAN:**  $\bar{x} = \frac{1}{n} \sum x_i$

- Estimated mean:** Computed disregarding some number of the highest and lowest values, less sensitive than extreme mean.
- Weighted mean:** Computed with a weight multiplied to each value, making some values influence the mean more heavily than others.

**MEDIAN:** Value that divides the set of the same number of observations by on each side of it; less sensitive to extreme values, for an odd number of values, it is the middle value; for an even number, it is the average of the middle two, see in Table 1, the median is the average of the 20th and 21st observations, or 1.5.

**MODE:** Observation or observations with the greatest frequency; a distribution can have one or more modes.

**GRAPHING TECHNIQUES**

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

**Histogram:** A bar graph used with quantitative, continuous variables.


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

**Continuous frequency curve:** A continuous line that traces a histogram when bars in all the bars' classes are stretched up to the adjacent higher class, except for a negligible slope.

**Polynomial curve:** The frequency curve is reshaped if needed around the center (median) = mean.

**Normal curve:** Both skewed curves, symmetric.

**Skewed curves:** Distributions that are asymmetric; frequency curves are shifted to the longer "tail" to the left (skewed to the right) or to the right (skewed to the left).






## Synopsis

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

## Book Information

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## Customer Reviews

I ordered these to study for the EPPP because I am a visual learner and I like the way these were organized and color-coded. There is a tremendous amount of material presented in a concise and easy to find away. Surprisingly comprehensive and has been a very useful tool for studying for the EPPP. As I have taken practice test, I am often able to quickly and easily look up answers using these cards.

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).

This helped me so much with my Statistics class, I passed with a 99%!

Excellent summary of the main topics covered in statistics. But you have to go beyond this to really master the concepts.

Nice laminated guide for easy reference. Serves the purpose of providing a handy quick "tip and technique" sheet. Reduces amount of time you would need to do Google searches and researching information in print material appendixes and glossaries.

Very helpful guide! It's really been a great asset in ensuring my success in the statistics class. The only thing that I didn't care for was that it was shipped in an envelope that wasn't sturdy so it was somewhat warped. Other than that, really good! Def. recommend!

Help me with some of this class

Such a huge help for statistics class!

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