

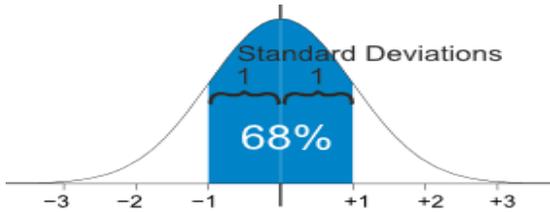
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Empirical Rule & Tchebysheff's Theorem – Statistics

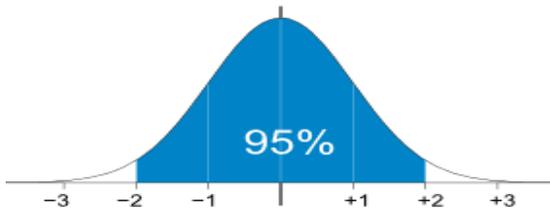
This worksheet outlines the major points of the Empirical rule and Tchebysheff's theorem. Tutors can use this as a handout or a teaching tool when dealing with tutees that are having difficulty with the following objects. The worksheet outlines the empirical rule, why it's used, and when to use it. The worksheet also outlines the Tchebysheff's theory, why it's used, and the formula basis of the theorem. Furthermore, various images on the worksheets can be used to demonstrate the normal curve and skewed distributions. It will be necessary to iterate to your students that this worksheet contains the three "magic" numbers used most commonly in statistics for these two rules. Professors may choose to round to one decimal, use whole numbers, or use different numbers all together. This can change within the worksheet; however the overall concepts remain the same.

Empirical Rule

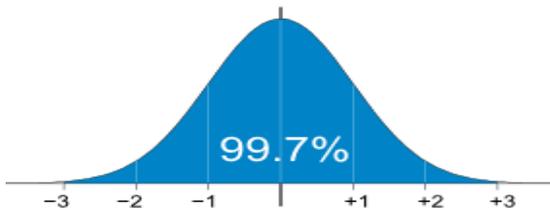
Definition: Rule states that for a normal distribution, nearly all the data will fall within three standard deviations of the mean. It can be broken down into three parts:



(1) 68% of data falls within the first standard deviation from the mean



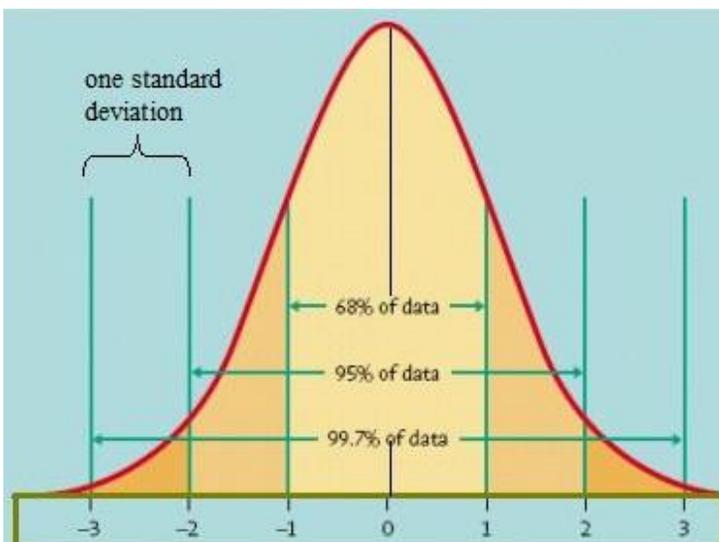
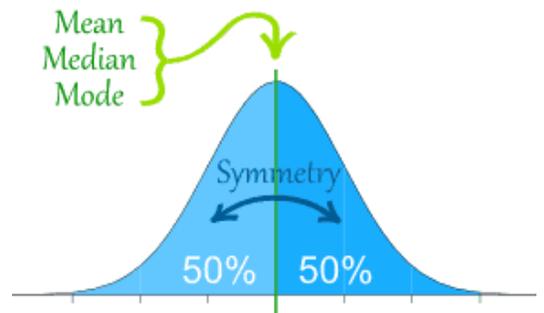
(2) 95% of the data fall within two standard deviations from the mean



(3) 99.7% of the data fall within three standard deviations from the mean

**** Important Tips to Remember ****

- EMPIRICAL RULE ONLY WORKS WITH A NORMAL DATA SET
 - Normal = Bell Curve = Symmetrical = Mound Shaped
 - In a normal curve the mean = median = mode
 - Normal Curve has an Area = 1

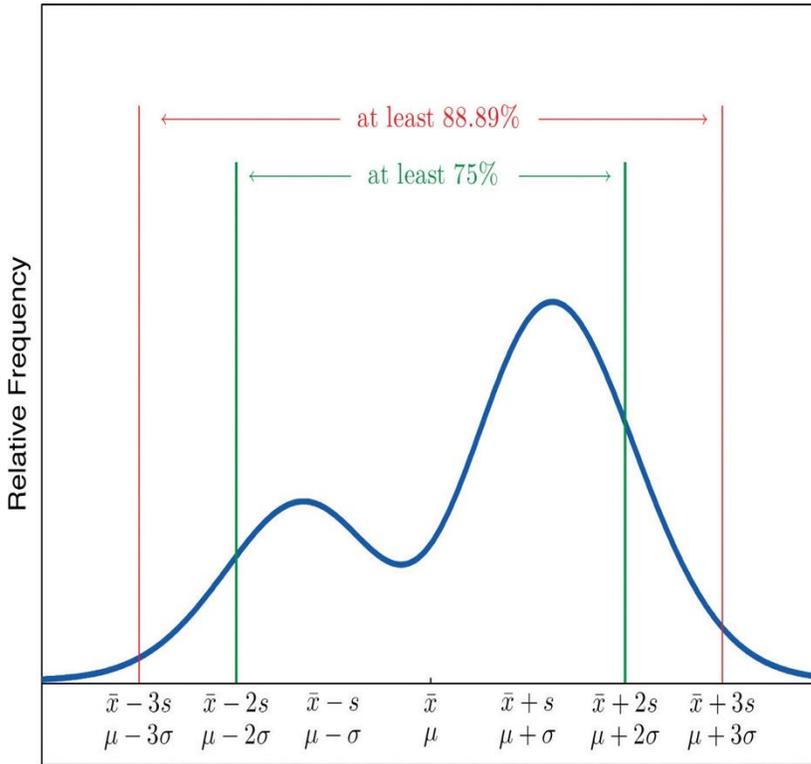


Why It's Used:

- Used in statistics for forecasting (predicting data)
- Can provide you with a rough estimate of what your data collection might look like in terms of an entire population
- Used to test if data is normally distributed or not
 - Professors will normally ask you to figure out if a data set is normal or skewed

Tchebysheff's Theorem

Definition: Theorem states that for any distribution, most of the data will fall within three standard deviations of the mean. It can be broken down into three parts:



(1) 0% of data falls within the first standard deviation from the mean

(2) 75% of the data fall within two standard deviations from the mean

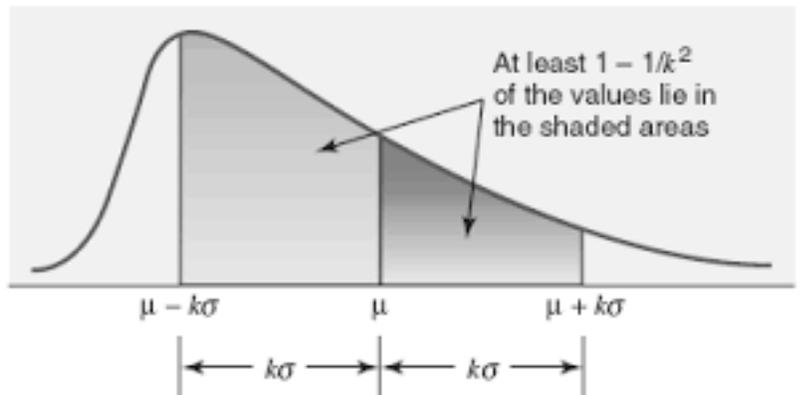
(3) 89% of the data fall within three standard deviations from the mean

**** Important Tips to Remember ****

- Tchebyshev's Theorem works with ANY type of distribution of data
 - Related to Relative Frequency Histograms
 - Very Conservative in data type and format
 - Does not have to be symmetric – can be skewed

Formula Basis

Given any number $k \geq 1$ and a population with n measurements, at least $\left[1 - \left(\frac{1}{k^2}\right)\right]$ of the measurements will lie within k standard deviations of their mean.



Works Cited

- "2.5 The Empirical Rule and Chebyshev's Theorem." UC Davis- StatWiki. UC Davis, 15 Apr. 2014. Web. 01 Mar. 2016.
<http://statwiki.ucdavis.edu/Textbook_Maps/General_Statistics/Shافر_and_Zhang's_Introductory_Statistics/02%3A_Descriptive_Statistics/2.5_The_Empirical_Rule_and_Chebyshev's_Theorem>.
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- Johnson, Richard Arnold, and Gouri K. Bhattacharyya. "Chapter 6: Normal Distribution." Statistics: Principles and Methods. 7th ed. Hoboken, NJ: Wiley, 2014. N. pag. Print.
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