EXAMPLE 1:

Suppose we want to estimate the average weight of an adult male in Dekalb County, Georgia. We draw a random sample of 1,000 men from a population of 1,000,000 men and weigh them. We find that the average man in our sample weighs 180 pounds, and the standard deviation of the sample is 30 pounds. What is the 95% confidence interval?

Part 1:

**Make sure the sample is normal and is a simple random sample.** They are looking at average weight and we can assume normality from the setup, as the judgement for normality in a sample mean problem is the sample size. Is ***n*(the sample size) > 30**?   
1,000> 30, so it is normal.

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| Part 2:  **Identify a sample statistic**. Since we are trying to estimate the mean weight in the population, we choose the mean weight in our sample (180) as the sample statistic. | | Part 3:  **Select a confidence level.** In this case, the confidence level is defined for us in the problem. We are working with a 95% confidence level. | |
| Standard Error Formula:  Picture  Margin of Error Formula:  Picture | Part 4:  **Find the standard error:** = 30/(square root of 1000) = .95 **Find critical value**.   * Compute alpha (α): α = 1 - (confidence level / 100) = 0.05 * Find the critical probability (p\*): p\* = 1 - α/2 = 1 - 0.05/2 = 0.975 * Find the [degrees of freedom](http://stattrek.com/Help/Glossary.aspx?Target=Degrees%20of%20freedom) (df): df = n - 1 = 1000 - 1 = 999 * The critical value is the t score having 999 degrees of freedom and a [cumulative probability](http://stattrek.com/Help/Glossary.aspx?Target=Cumulative%20probability) equal to 0.975. From the [t Distribution Calculator](http://stattrek.com/Tables/T.aspx), we find that the critical value is 1.96.   **Compute margin of error (ME)**: ME = critical value \* standard error = 1.96 \* 0.95 = 1.86   * Specify the confidence interval. The range of the confidence interval is defined by the *sample statistic* + *margin of error*. And the uncertainty is denoted by the confidence level. Therefore, this 95% confidence interval is 180 + 1.86. | |