

## Sample Size and Power for One Sample Mean

Use to interactively explore the relationships between Power, Sample Size, and Difference to Detect in testing a hypothesis for a single population mean. See the One Sample t-test and Confidence Interval guide to learn how to perform a statistical test for a population mean.

## Sample Size and Power - One Sample Mean

- 1. Select DOE > Sample Size Explorers and choose Power > Power for One Sample Mean.
- 2. Choose the type of test: One-Sided or Two-Sided and Alpha (significance level for the test). Here we consider the two-sided alternative hypothesis  $H_0$ :  $\mu = \mu_0$  vs.  $H_A$ :  $\mu \neq \mu_0$
- 3. Choose if standard deviation is known. If "Yes" analysis will be based on the Z-Test. If "No" analysis will be based on the t-Test.
- 4. Enter a value for the **Standard Deviation**. Here we assume 2.0.
- Enter the Difference to Detect. This is the difference between a population mean under H<sub>A</sub> considered to be 5. true from the value of the population mean under  $H_0$ . Here we consider a difference of 3.0, which is 3.0/2.0 = 1.5 standard deviations from the value of the population mean under  $H_0$ .
- 6. Select parameter to solve for. Here we chose **Sample Size**.
- 7. Enter a value for the **Power**. Here we entered 0.80. The solution (n=6) is shown in the **Sample Size** field. Note: The **Power** field changed to 83.25% since sample size can only be an integer. n=5 results in a Power of 71.1%.
- 8. Use the interactive cross-hair tool (or type in values) for Power, Sample Size, Difference to Detect, and Std Dev to study the relationship between these parameters solving for many different scenarios.



The settings and solution for each analysis performed can be saved. The table of saved settings shows the results of five different analyses performed when testing the hypothesis H<sub>0</sub>:  $\mu = \mu_0$  vs. H<sub>A</sub>:  $\mu \neq \mu_0$ 

Sample Size Sample Size

Std Dev (o)

Difference to Detect

- 1. What sample size is needed to achieve a power of 80% at detecting a difference of 3/2= 1.5 std dev? Answer: n = 6
- 2. What is the power with a sample size of 5 for the above scenario? Answer: Power = 71.1%
- 3. What is the power for a sample size of 10 in the above scenario? Answer: Power = 98.7%
- 4. What is the power for a sample size of 10 at detecting a difference of 1/2 = 0.5 std dev? Answer: Power = 29.3%
- 5. What sample size is needed to achieve a power of 80% at detecting a .5 std dev difference? Answer: n = 34

Note: Determining sample size to achieve a desired margin of error in a Confidence Interval can be done using DOE > Sample Size Explorers > Confidence Intervals > Margin of Error for One Sample Mean.

Visit Design of Experiments Guide > Sample Size Explorers in JMP Help to learn more.