

1. An experiment is conducted to study the effect of drilling method on drilling time. Each method (dry drilling, wet drilling) is used on $n = 12$ rocks. Drilling times are measured in 1/100 minutes.

The data is available on Blackboard as an Excel File.

(a) Compute a 95% confidence interval for $\delta = \mu_1 - \mu_2$.

Provide an interpretation, stated in the context of the problem.

(b) Explain how a confidence interval provides a complementary result to a hypothesis test.

2. A product developer is investigating the tensile strength of a new synthetic fiber. A completely randomized design with five levels of cotton content is performed, with $n = 5$ specimens per level.

The data is available on Blackboard as an Excel File.

(a) Compute and display 95% confidence intervals for all pairwise comparisons.

(b) Explain how a confidence interval can be used in testing $H_o : \mu_i = \mu_j$, for each pair of factor levels.

(c) Explain how computing multiple intervals impacts the probability of committing an error.

3. An experiment to compare a new drug to a standard is in the planning stages. The response variable of interest is the clotting time (in minutes) of blood drawn from a subject. The experimenters want to perform a two sample t test at level $\alpha = .05$, having power $\pi = .8$ at $\delta_A = 0.25$, for standard deviation $\sigma = 0.7$.

(a) Determine the sample size for each drug in order to achieve the stated test specifications.

(b) Graph the power curve for the chosen sample size. Explain how the power curve displays the desired properties of the test.

(c) Provide a general explanation of how δ_A can be determined.

4. Refer back to the tensile strength example from problem 2. Use the data from this study to perform a power analysis for a main study. The experimenters desire a level $\alpha = .05$ test with power $\pi = .8$

(a) Determine the sample size for each group based on specifying the maximum difference in means.

(b) Use a simulation to compute power at $n = 3$ using the pilot study to specify the model parameters.

(c) Comment on the use of pilot study data in a power analysis.