

Part of your 2nd year oral exam will be to answer questions related to the most important concepts you learned in the *Advanced Methods in Biostatistics I and II* classes. These questions could include (among many others) the following:

- How would you define the Multivariate Normal Distribution?
- What is a quadratic form?
- How can we determine the independence between quadratic forms?
- What is a projection matrix?
- In linear model theory, why are projection matrices so important?
- What are least squares estimates?
- What is the Best Linear Unbiased Estimate of a parameter?
- What are the consequences of overfitting and underfitting?
- What are the benefits of having orthogonal structures in the design matrix?
- What are estimable functions? Testable Hypothesis?
- What does the Gauss-Markov theorem state?
- What is leverage? What is influence?
- What is an ANOVA? Why is it called ANOVA?
- Explain the basic ideas behind an ANOVA.
- What test statistics do we derive in ANOVAs?
- How do those test statistics fit into the standard linear model theory?
- What is the connection between F and t-tests?
- What are the differences between a nested and a crossed design?
- What are fixed effects? What are random effects? What are mixed effects models?
- What is experimental design?
- What is blocking?
- What are the benefits of a balanced design?
- What is interaction?