

Core Competency Standards

Core competencies are listed in the order in which they are first introduced and first assessed in the course. However, competencies are not isolated or self-contained topics. Once a competency is introduced, it may be revisited, integrated, and assessed again in later blocks.

Standards for Block 1 – Probability Models

1. Compute and interpret probabilities within a given context; Construct and analyze probability tables; State and apply Bayes' Rule to real-world problems.
2. Develop and apply probabilistic models to solve real-world problems; Compare and contrast discrete and continuous probability distributions; Select and apply named probability distributions in a given context.

Standards for Block 2 – Data Wrangling & Visualization

3. Describe and evaluate the context for a statistic, statistical test, or procedure, including identification of sampling biases and evaluation of data collection design; Propose improvements or alternatives when appropriate.
4. Compute, interpret, and compare measures of typical and spread; Evaluate the suitability of different measures given the data and context.
5. Create appropriate graphical summaries given the data and context; Evaluate the strengths and limitations of each type of graphical summary.

Standards for Block 3 – Hypothesis Testing

6. Compare and contrast sample distributions and sampling distributions; Compare and contrast sampling and resampling; Compute and interpret standard error in context and explain its meaning to a non-expert.
7. Compute and interpret confidence intervals and explain their meaning to a non-expert; Articulate how confidence intervals relate to statistical inference.
8. State and apply the four steps of a hypothesis test in a given context; Relate hypothesis testing to confidence intervals; Articulate the limits and potential abuses of hypothesis testing.
9. Define and interpret Type I and Type II errors; Analyze their relationship and trade-offs in decision-making.

Standards for Block 4 – Linear Regression

10. Specify and fit linear models; Interpret model coefficients and predicted values in a contextually meaningful way; Conduct and interpret inference for linear models; Evaluate linear model performance using appropriate statistical measures.
11. Evaluate the assumptions, limitations, and potential misuses of linear regression models; Assess model assumptions using graphical diagnostics; Explain phenomena such as Simpson's paradox; Articulate risks associated with multiple testing and p-hacking; Communicate these issues to both expert and non-expert audiences (using accessible language and examples).
12. State and apply the Central Limit Theorem in varied contexts; Describe how the Central Limit Theorem relates to the sampling distribution.