

Review

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Hampden-Sydney College

Tue, May 1, 2012

Outline

- 1 Time and Place
- 2 Chapter 1 – Introduction
- 3 Chapters 2 - 4 – Designing Studies
- 4 Chapters 5 - 7 – Probability Distributions
- 5 Chapter 8 – Sampling Distributions
- 6 Chapters 9 - 11 – Hypothesis Testing
- 7 Chapters 13 - 14 – Two-Variable Problems
- 8 Making Decisions

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Time and Place

- Time: Monday, May 7, 2:00 - 5:00 pm.
- Place: Bagby 022 (here).

Goals of the Course

- Keep in mind the goals of the course.

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 - Understanding

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 - Proficiency

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 - Understanding
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Goals of the Course

- Keep in mind the goals of the course.
 - Understanding
 - Proficiency
- Understanding aids proficiency.
- Proficiency aids understanding.
- Neither one is of much value without the other.

The Troublesome Problems

- The following problems gave the most trouble on the tests.

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- Test 1 – Problem 9 (68%).

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- Test 1 – Problem 9 (68%).
- Test 2 – Problems 9 (36%) and 10 (39%).

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- The following problems gave the most trouble on the tests.
- Test 1 – Problem 9 (68%).
- Test 2 – Problems 9 (36%) and 10 (39%).
- Test 3 – Problem 1 (59%) and 5 (60%).

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- Introduction to Hypothesis Testing.
 - Bag A vs. Bag B , or some similar situation.
 - Direction of extreme.
 - Type I error - α .
 - Type II error - β .
 - p -value.

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- Random Sampling.
 - Population.
 - Sample.
 - Simple random sample - `randInt()`.
 - Stratified sample - heterogeneous groups.
 - Cluster sample - homogeneous groups.
 - Systematic sampling.

- Observational Studies and Experiments.
 - Variable.
 - Explanatory variable.
 - Response variable.
 - Confounding variable.
 - Observational study.
 - Experimental study.

Chapter 4

- Graphical Displays of Qualitative Data.
 - Pie chart.
 - Bar graph.
- Graphical Displays of Quantitative Data.
 - Frequency plot.
 - Stem-and-leaf display.
 - Histogram.

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- Computation of Basic Statistics.
 - Statistic vs. parameter.
 - Measures of Center.
 - Median.
 - Mean.
 - Measures of Spread.
 - Standard deviation.
 - Variance.
 - Quartiles.
 - Five-number summary (from stem-and-leaf display).
 - Boxplots.

- Probability Distributions
 - Normal.
 - Uniform.
 - Triangular.
 - Probability.
 - Percentile.

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- Sampling Distributions of \bar{x} and \hat{p}
 - For *very small* samples, find sampling distributions for \bar{x} and \hat{p} by hand.
 - For large samples, use the Central Limit Theorem for Means and Proportions.
- For all sample sizes, CLT gives mean and standard deviation of \hat{p} and \bar{x} —only the shape requires a sufficiently large sample size.

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- Hypothesis Tests and Confidence Intervals for Proportions (One Sample)
 - The seven steps of hypothesis testing.
 - One-sample test for p .
 - One-sample confidence interval for p .
 - Know the formula for test statistic.
 - Know the formula for confidence interval.

- Hypothesis Tests and Confidence Intervals for Means (One Sample)
 - The seven steps of hypothesis testing.
 - One-sample test for μ .
 - One-sample confidence interval for μ .
 - Standard normal vs. t distributions.
 - Know the formulas for test statistics (z and t).
 - Know the formulas for confidence intervals (z and t).

- Hypothesis Tests and Confidence Intervals for Differences between Means and Proportions (Two Samples).
 - Independent sample vs. paired sample.
 - The seven steps of hypothesis testing.
 - Test for $\mu_D = 0$ (paired differences).
 - Two-sample test for $\mu_1 - \mu_2$.
 - Two-sample test for $p_1 - p_2$.
 - Standard normal vs. t distributions.
 - Formulas are on the formula sheet.

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- Linear Regression.
 - Bivariate quantitative data.
 - Scatterplot.
 - Equation of the regression line $\hat{y} = a + bx$.
 - Prediction, interpolation, extrapolation.
 - Correlation coefficient r .
 - Coefficient of determination r^2 .
 - Sums of squares - SST, SSR, SSE.
 - Strength vs. significance of the relationship.
 - Test of significance of β and ρ .
 - Formulas are on the formula sheet.

- Analysis of Count Data.
 - Expected counts.
 - Chi-square distribution.
 - Goodness of fit test.
 - Tests of independence or homogeneity.
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Making Decisions

- How would you recognize a hypothesis-testing problem?

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- How would you recognize a paired-difference problem?

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- How would you determine whether it involved one sample or two samples?
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- How would you recognize a confidence-interval problem?

Making Decisions

- How would you recognize a hypothesis-testing problem?
- How would you determine whether it involved one sample or two samples?
- How would you determine whether it involved means or proportions?
- How would you recognize a paired-difference problem?
- How would you recognize a confidence-interval problem?
- How would you recognize a goodness-of-fit problem?

Making Decisions

- How would you recognize a hypothesis-testing problem?
- How would you determine whether it involved one sample or two samples?
- How would you determine whether it involved means or proportions?
- How would you recognize a paired-difference problem?
- How would you recognize a confidence-interval problem?
- How would you recognize a goodness-of-fit problem?
- How would you recognize a test-of-homogeneity problem (or independence)?