

STAT 252 Statistical Inference for Management II Winter 2010

Exam 1 Preparation

- Logistical details
 - Wednesday, January 27
 - 50 minutes
 - Open-book, open-notes
 - Calculator needed
 - Tables (z - and t - and chi-square) needed
- Coverage
 - Handouts 1-9
 - Quizzes 1-9
 - Investigations 1-5
- Resources available online
 - This preparation sheet
 - Day-by-day handouts
 - Quiz solutions
 - Investigation solutions
- Types of questions to expect
 - Short answer (e.g., identifying types of variables, distinguishing observational studies from experiments)
 - Calculations (e.g., confidence interval, test statistic)
 - Interpretations and explanations (e.g., interpreting a confidence interval, drawing a conclusion from a p -value)
 - Some based on computer output
 - Possibly including irrelevant output
 - Similar to in-class examples, quizzes, investigations
- Advice for preparing
 - Prepare and organize your notes carefully
 - Don't study less because it's open-notes/book
 - Plan not to rely on your notes/book too much
 - Re-read the day-by-day handouts
 - Re-answer those questions without consulting your earlier answers
 - Focus on understanding, not memorization
 - Review and make sure that you can answer quiz, investigation questions
 - Ask questions during review class session, office hours
- Advice during the exam
 - Show up on time!
 - Be cognizant of time constraint
 - Read carefully
 - Relate conclusions to context
 - Write and explain clearly
 - Do not elaborate excessively
 - Show details of calculations
 - Take advantage of partial information

Outline (of most important topics)

- Fundamental terms
 - Observational unit, variable
 - Categorical vs. quantitative
 - Explanatory vs. response
 - Population, sample
 - Parameter, statistic
- Studies and conclusions
 - Sampling
 - Sampling bias
 - Random sampling
 - Observational studies vs. controlled experiments
 - How to distinguish
 - Scope of conclusions
 - Confounding
 - Causation
 - To what population can results be generalized?
 - Depends on how data were collected (e.g., random sampling?)
 - Can a cause/effect conclusion be drawn?
 - Depends on how subjects got into groups (e.g., random assignment?)
- Descriptive statistics
 - Graphical displays
 - Dotplot, histogram, boxplot
 - Shape, center, spread, outliers
 - Segmented bar graph
 - Numerical summaries
 - Mean, standard deviation, five-number summary
 - Two-way table, conditional proportions
- Statistical inference concepts
 - Statistical significance
 - Null model/hypothesis
 - p -value
 - Approximation through simulation
 - Interpretation
 - Components of hypothesis test
 - Null, alternative hypothesis
 - Test statistic
 - p -value
 - Significance level
 - Test decision
 - Confidence interval
 - General form: statistic \pm margin-of-error
 - Margin-of-error = critical value \times standard error
 - Interpretation

- Effects of sample size, confidence level
 - Checking technical conditions
 - Other inference issues
 - Duality between tests, intervals
 - Statistical vs. practical significance
 - Types of errors, power
- One-sample inference
 - z -test, z -interval for a population proportion π
 - t -test, t -interval for a population mean μ
- Inference for comparing two groups
 - z -test, z -interval for comparing proportions
 - Interpretation, conclusions
 - Effect of sample size
 - t -test, t -interval for comparing means
 - Independent samples, random assignment
 - Interpretation, conclusions
 - Effect of difference in sample means, sample variability, sample sizes
 - Paired t -test, t -interval
 - Recognizing paired design
 - One-sample t -procedure on differences
- Chi-square tests for categorical data
 - Goodness of fit test
 - Expected counts
 - Test statistic, p -value
 - Two-way tables
 - Segmented bar graphs
 - Conditional proportions
 - Tests of independence, homogeneity of proportions
 - Expected counts, test statistic, p -value
 - Largest contribution to test statistic

Which procedure to use when?

Now that we have learned many procedures for making inferences from data, one of the challenges is deciding which procedure to apply in a given situation. Some of the questions to ask yourself are:

- Is there only a response variable, or is there also an explanatory variable?
- Is the response variable quantitative or categorical?
- Is the explanatory variable quantitative or categorical?
- For categorical variables, are there two categories or more than two?
- When there is a quantitative response variable and a binary categorical explanatory variable, were the data collected in a matched-pairs or independent-samples design?

Some of the statistical inference techniques in this course include:

- A. One-sample z -procedures for a proportion
- B. One-sample t -procedures for a mean
- C. Two-sample z -procedures for comparing proportions

- D. Two-sample t -procedures for comparing means
- E. Paired-sample t -procedures
- F. Chi-square goodness-of-fit procedures
- G. Chi-square procedures for two-way tables

For each of the following research questions and studies, indicate (by capital letter) the appropriate inference procedure to consider. Also state the hypotheses to be tested.

a) Do male and female Cal Poly students differ with regard to how often they drink coffee (every day, sometimes, never)?

b) A recent survey investigated whether American adults who have children are significantly more likely to play video games than American adults who do not have children.

c) I once read an article advising people to walk 10,000 steps per day. I bought a pedometer that counted how many steps I took, and I wanted to test whether my average number of steps per day exceeds 10,000.

d) Do restaurant customers tend to order more expensive meals when classical music is playing in the background?

e) Olympic wrestlers wear red or blue. Does the wrestler wearing red win more than half the time?

f) Do equal proportions of Cal Poly students describe themselves as political conservatives, moderates, and liberals?

g) Tiger Woods missed many golf tournaments in the second half of 2008 when he was recovering from knee surgery. Were television ratings for the tournaments that he missed significantly lower than they had been in the previous year when he participated?

h) Are people more likely to click on an internet ad for a book titled "SuperCrunchers" or for a book titled "Thinking-by-Numbers"?

i) Do women tend to identify more people as close friends than men do?