

Statistics Test Guidelines by Rob Snow, June 2004

I. Exploring Data

A. Interpreting graphs of distributions of one variable data (stemplot, histogram)

1. Center and spread
2. Outliers and unusual features
3. Shape (symmetric, skewed)

B. Summarizing distributions of one variable data

1. Mean and median
2. Range, Interquartile Range, standard deviation
3. Quartiles, percentiles, z-scores
4. Boxplots
5. effect of linear transformations on summary statistics

C. Comparing distributions of one variable data (back to back stemplots, parallel boxplots)

1. Compare center and spread
2. Compare clusters and gaps
3. Compare outliers and other unusual features
4. Compare shapes.

D. Exploring two-variable data sets

1. Scatterplots
2. Correlation and linear relationships
3. Least squares regression line
4. Residual plots, outliers, influential point
5. Logarithmic transformations and linearity.

II. Planning a Study

A. Overview of methods of data collection

1. Census
2. Sample survey
3. Experiment
4. Observational study

B. Planning and Conducting Surveys

1. Simple random sample
2. Sampling error
3. Well designed and conducted survey elements
4. bias
5. Stratified and Systematic sampling

C. Planning and Conducting Experiments

1. Experiments vs. Observational Studies
2. Confounding, control group, placebo, blinding
3. Treatment, experimental units, randomization
4. Randomized paired comparison design
5. Replication, blocking

III. Anticipating Patterns: Models Using Probability and Simulation

A. Probability

1. "Law of Large Numbers" concept
2. Addition Rule, Multiplication Rule, conditional probability, independence
3. Discrete random variables
4. Binomial, geometric distributions
5. Mean and Standard Deviation of random variable from 3,4.

B. Combining independent random variables

1. Notion of independent vs. dependent
2. Mean and Standard Deviation for sum and difference of independent random variables

C. Normal Distributions

1. Properties
2. Using tables of normal distributions

3. Using it as a model for measurements
- D. Sample Distribution
  1. Proportion Distribution
  2. Sample Mean Distribution
  3. Central Limit Theorem
  4. Difference between two independent sample proportions
  5. Difference between two independent sample means
- IV. Statistical Inference: Confirming Models
  - A. Confidence Intervals
    1. Meaning of
    2. For a proportion
    3. For a sample mean
    4. For a difference between two proportions
    5. For a difference between two means (paired or unpaired)
  - B. Significance Testing
    1. Null and Alternative Hypotheses, p-values, one and two sided tests
    2. Proportion Test
    3. Sample Mean Test
    4. Difference between Proportions
    5. Difference between Means (paired, unpaired)
    6. Chi-Square Testing for goodness of fit, independence
  - C. Special cases of normally distributed data
    1. t-distribution
    2. single sample t procedure
    3. Two sample (independent and matched pairs) t procedures
    4. Inference for slope of least squares line