Advanced Placement Statistics

The purpose of Advance Placement Statistics is to introduce students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. The four major themes are exploring data, planning a study, anticipating patterns, and statistical inference.

Prerequisites

- Completion of courses Functions, Statistics, and Trigonometry OR Algebra II/Trigonometry.
- Special Requirements: TI-84 (preferred) or TI-83 (acceptable) graphing calculator

Competency Goal 1:
The learner will organize data by looking for patterns and departure from patterns.

Objectives

1.01 Students will explore and understand data.
   a. Explore data by looking at dotplots, histograms, boxplots, and stemplots. Identify center, spread, and shape of the overall distribution and check for outliers.

   b. Describe distributions with numbers using mean, median, mode, quartiles, variance, and standard deviation.

   c. Generate conjectures about relationships among variables by carefully observing patterns in data.

   d. Analyze categorical data and be able to describe relationships between two categorical variables.

   e. Examine density curves, including the Normal.
      - Apply the Empirical Rule
      - Use Standardized scores to compare distributions.
      - Measure position, quartiles, and percentages

   f. Analyze frequency tables and contingency tables
      - Marginal and joint frequencies for 2-way tables
      - Conditional frequencies
1.04 Analyze bivariate data.

a. Recognize and analyze correlation and linearity.
b. Use technology to determine the least squares regression line.
c. Create residual plots and identify outliers and influential points to analyze data and determine the appropriateness of the model.
d. Use logarithmic and power transformations to achieve linearity.
e. Predict outcomes in the context of the problem and determine if cause and effect can be claimed.

Competency Goal 2:
The learner will collect and analyze data according to a well developed plan.

Objectives

2.01 Use simulations and the Random Number Table to understand random behavior.

2.01 Use and compare methods of data collection, including census, survey, experiment, and observational study.

a. Simple Random Sample
b. Stratified Random Sample
c. Cluster sampling.

2.02 Apply principles and methods in designed experiments; identify difficulties, including bias, confounding, lurking variables, placebo effect, and blinding.

a. completely randomized design
b. randomized block design
c. matched pair design

2.03 Generalize results that can be drawn from observational studies, experiments, and surveys.
Competency Goal 3: 
The learner will explore random phenomena using probability and simulation.

3.01 Apply concepts of probability to solve problems, including binomial and geometric distributions.

3.03 Distinguish between continuous and discrete random variables.

3.04 Find the mean and variance of random variables.

3.05 Combine independent random variables.
   a. understand the difference between independence and dependence.
   b. calculate the mean and standard deviation between sums and differences of independent random variables.

Competency Goal 04:
Students will use and apply Sampling Distributions
4.01 Understand the Distribution of Sample Proportions and the difference of sample proportions.
4.02 Understand the Distribution of Sample Means and the difference of sample means.
4.03 Understand and apply the Central Limit Theorem.

Competency Goal 05: 
The learner will understand inference using confidence intervals for proportions and testing hypothesis about proportions.

5.01 Recognize, construct and interpret results using confidence intervals for proportions in context.

5.02 Understand the logic of confidence intervals, the meaning of confidence level, and properties of confidence intervals.

5.03 Calculate and understand confidence intervals for proportion and difference between two proportions.

5.04 Perform and understand testing hypothesis about proportions and difference of proportions

5.05 Understand the logic of hypothesis tests using one and two sided tests, type I and type II errors, and the concept of power.
5.06 Know the conditions necessary to produce confidence intervals and hypothesis tests about proportions.

**Competency Goal 06:**
The learner will understand inference using confidence intervals for means and hypothesis tests about means.

6.01 Recognize when the t-distribution is used.

6.02 Recognize, construct and interpret results using confidence intervals for means in context.

6.03 Conduct and understand hypothesis tests for means and difference between two means in context.

6.04 Know the conditions necessary to produce confidence intervals and hypothesis tests about means.

**Competency Goal 07:**
Conduct and understand chi-squared test for goodness of fit, for independence, and for homogeneity of proportions. Know the conditions necessary for these tests.

**Competency Goal 08:**
Conduct and understand tests for slope of a least-squares regression line. Know the conditions necessary for this test.

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