

ISPS AP Statistics Standards and Benchmarks

Grades 11-12

Standard 1 - Students observe patterns and departures from patterns

Benchmarks:

- 1.STAT.1 Students interpret graphical displays of distributions of univariate data (dot plot, stem plot, histogram, cumulative frequency plot)
- Center and spread
 - Clusters and gaps
 - Outliers and other unusual features
 - Shape
- 1.STAT.2 Students summarize distributions of univariate data
- Measuring center: median, mean
 - Measuring spread: range, Interquartile range, standard deviation
 - Measuring position: quartiles, percentiles, standardized scores (z-scores)
- 1.STAT.3 Students compare distributions of univariate data (dot plots, back-to-back stem plots, parallel box plots)
- Comparing center and spread: within group, between group variation
 - Comparing clusters and gaps
 - Comparing outliers and other unusual features
 - Comparing shapes
- 1.STAT.4 Students analyze and interpret bivariate data
- Analyzing patterns in scatter plots
 - Correlation and linearity
 - Least squares regression line
 - Residual plots, outliers, and influential points
 - Transformations to achieve linearity: logarithmic and power transformations
- 1.STAT.5 Students analyze and interpret categorical data: frequency tables
- Marginal and joint frequencies for two-way tables
 - Conditional relative frequencies and association

Standard 2 – Students plan a study: Decide what and how to measure

Benchmarks:

2. STAT.1 Students understand overview of methods of data collection
- Census
 - Sample survey
 - Experiment
 - Observational study
2. STAT.2 Students plan and conduct surveys
- Characteristics of a well-designed and well-conducted survey
 - Populations, samples, and random selection
 - Sources of bias in surveys
 - Simple random sampling
 - Stratified random sampling
2. STAT.3 Students plan and conduct experiments
- Characteristics of a well-designed and well-conducted experiment
 - Treatments, control groups, experimental units, random assignments, and replication
 - Sources of bias and confounding, including placebo effect and blinding
 - Completely randomized design
 - Randomized block design, including matched pairs design.
2. STAT.4 Determine generalizability of results from observational studies, experimental studies, and surveys

Standard 3 - Students anticipate patterns: Produce models using probability theory and simulation

Benchmarks:

- 3.STAT.1 Students understand probability as relative frequency
- Law of large numbers concept
 - Addition rule, multiplication rule, conditional probability, and independence
 - Discrete random variables and their probability distributions, including binomial
 - Simulation of probability distributions, including binomial and geometric
 - Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable
- 3.STAT.2 Students combine independent random variables
- Notion of independence versus dependence
 - Mean and standard deviation for sums and differences of independent random variables
- 3.STAT.3 Students understand the normal distribution
- Properties of the normal distribution
 - Using table of the normal distribution
 - The normal distribution as a model for measurements
- 3.STAT.4 Students understand and determine sampling distributions
- Sampling distribution of a sample proportion
 - Sampling distribution of a sample mean
 - Central Limit Theorem
 - Sampling distribution of a difference between two independent sample proportions
 - Sampling distribution of a difference between two independent sample means
 - Simulation of sampling distributions

Standard 4 – Statistical inference: Confirming models

Benchmarks:

- 4.STAT.1 Students understand and calculate confidence intervals
- The meaning of a confidence interval
 - Large sample confidence interval for a proportion
 - Large sample confidence interval for a mean
 - Large sample confidence interval for a difference between two proportions
 - Large sample confidence interval for a difference between two means (unpaired and paired)
- 4.STAT.2 Students understand, calculate and interpret tests of significance
- Logic of significance testing, null and alternative hypothesis; p-values; one-and two-sided tests; concepts of Type I and Type II errors; concept of power
 - Large sample test for a proportion
 - Large sample test for a mean
 - Large sample test for a difference between two proportions
 - Large sample test for a difference between two means (unpaired and paired)
 - Chi-square test for goodness of fit, homogeneity of proportions, and independence (one-and two-way tables)
- 4.STAT.3 Understand and calculate special case of normally distributed data
- T-distribution
 - Single sample t procedures
 - Two sample (Independent and matched pairs) t procedures
 - Inference for slope of least-squares regression line