California Content Standards: AP Statistics

(Remain Unchanged In Common Core Standards)

1.0 Students solve probability problems with finite sample spaces by using the rules for addition, multiplication, and complementation for probability distributions and understand the simplifications that arise with independent events.

2.0 Students know the definition of conditional probability and use it to solve for probabilities in finite sample spaces.

3.0 Students demonstrate an understanding of the notion of discrete random variables by using this concept to solve for the probabilities of outcomes, such as the probability of the occurrence of five or fewer heads in 14 coin tosses.

4.0 Students understand the notion of a continuous random variable and can interpret the probability of an outcome as the area of a region under the graph of the probability density function associated with the random variable.

5.0 Students know the definition of the mean of a discrete random variable and can determine the mean for a particular discrete random variable.

6.0 Students know the definition of the variance of a discrete random variable and can determine the variance for a particular discrete random variable.

7.0 Students demonstrate an understanding of the standard distributions (normal, binomial, and exponential) and can use the distributions to solve for events in problems in which the distribution belongs to those families.

8.0 Students determine the mean and the standard deviation of a normally distributed random variable.

9.0 Students know the central limit theorem and can use it to obtain approximations for probabilities in problems of finite sample spaces in which the probabilities are distributed binomially.

10.0 Students know the definitions of the mean, median, and mode of distribution of data and can compute each of them in particular situations.

11.0 Students compute the variance and the standard deviation of a distribution of data.

12.0 Students find the line of best fit to a given distribution of data by using least squares regression.

13.0 Students know what the correlation coefficient of two variables means and are familiar with the coefficient's properties.

14.0 Students organize and describe distributions of data by using a number of different methods, including frequency tables, histograms, standard line graphs and bar graphs, stem-and-leaf displays, scatterplots, and box-and-whisker plots.

15.0 Students are familiar with the notions of a statistic of a distribution of values, of the sampling distribution of a statistic, and of the variability of a statistic.

16.0 Students know basic facts concerning the relation between the mean and the standard deviation of a sampling distribution and the mean and the standard deviation of the population distribution.

17.0 Students determine confidence intervals for a simple random sample from a normal distribution of data and determine the sample size required for a desired margin of error.

18.0 Students determine the P- value for a statistic for a simple random sample from a normal distribution.

19.0 Students are familiar with the chi- square distribution and chi- square test and understand their use.

COLLEGE BOARD COURSE OUTLINE

I. Exploring Data: Describing patterns and departures from patterns (20%-30%)

Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns. Emphasis should be placed on interpreting information from graphical and numerical displays and summaries.

A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)

      1. Center and spread

      2. Clusters and gaps

      3. Outliers and other unusual features

      4. Shape

B. Summarizing distributions of univariate data

      1. Measuring center: median, mean

      2. Measuring spread: range, interquartile range, standard deviation

      3. Measuring position: quartiles, percentiles, standardized scores (z-scores)

      4. Using boxplots

      5. The effect of changing units on summary measures

C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)

      1. Comparing center and spread: within group, between group variation

      2. Comparing clusters and gaps

      3. Comparing outliers and other unusual features

      4. Comparing shapes

D. Exploring bivariate data

      1. Analyzing patterns in scatterplots

      2. Correlation and linearity

      3. Least-squares regression line

      4. Residual plots, outliers, and influential points

      5. Transformations to achieve linearity: logarithmic and power transformations

E. Exploring categorical data

      1. Frequency tables and bar charts

      2. Marginal and joint frequencies for two-way tables

      3. Conditional relative frequencies and association

      4. Comparing distributions using bar charts

II. Sampling and Experimentation: Planning and conducting a study (10%-15%)

Data must be collected according to a well-developed plan if valid information on a conjecture is to be obtained. This plan includes clarifying the question and deciding upon a method of data collection and analysis.

A. Overview of methods of data collection

    1. Census

    2. Sample survey

    3. Experiment

    4. Observational study

B. Planning and conducting surveys

    1. Characteristics of a well-designed and well-conducted survey

    2. Populations, samples, and random selection

    3. Sources of bias in sampling and surveys

    4. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling

C. Planning and conducting experiments

    1. Characteristics of a well-designed and well-conducted experiment

    2. Treatments, control groups, experimental units, random assignments, and replication

    3. Sources of bias and confounding, including placebo effect and blinding

    4. Completely randomized design

    5. Randomized block design, including matched pairs design

D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys.

III. Anticipating Patterns: Exploring random phenomena using probability and simulation (20%-30%) *Probability is the tool used for anticipating what the distribution of data should look like under a given model.*

A. Probability

1. Interpreting probability, including long-run relative frequency interpretation

2. 'Law of Large Numbers' concept

3. Addition rule, multiplication rule, conditional probability, and independence

4. Discrete random variables and their probability distributions, including binomial and geometric

5. Simulation of random behavior and probability distributions

6. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable

B. Combining independent random variables

1. Notion of independence versus dependence

2. Mean and standard deviation for sums and differences of independent random variables

C. The normal distribution

1. Properties of the normal distribution

2. Using tables of the normal distribution

3. The normal distribution as a model for measurements

D. Sampling distributions

1. Sampling distribution of a sample proportion

2. Sampling distribution of a sample mean

3. Central Limit Theorem

4. Sampling distribution of a difference between two independent sample proportions

5. Sampling distribution of a difference between two independent sample means

6. Simulation of sampling distributions

7. t-distribution

8. Chi-square distribution

IV. Statistical Inference: Estimating population parameters and testing hypotheses (30%-40%) *Statistical inference guides the selection of appropriate models.*

A. Estimation (point estimators and confidence intervals)

    1. Estimating population parameters and margins of error

    2. Properties of point estimators, including unbiasedness and variability

    3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals

    4, Large sample confidence interval for a proportion

    5. Large sample confidence interval for a difference between two proportions

    6. Confidence interval for a mean

    7. Confidence interval for a difference between two means (unpaired and paired)

    8. Confidence interval for the slope of a least-squares regression line

B.   Tests of significance

    1. Logic of significance testing, null and alternative hypotheses; p-values;

    one- and two-sided tests; concepts of Type I and Type II errors; concept

    of power.

    2. Large sample test for a proportion

    3. Large sample test for a difference between two proportions

    4. Test for a mean

    5. Test for a difference between two means (unpaired and paired)

    6. Chi-square test for goodness of fit, homogeneity of proportions, and

    independence (one- and two-way tables)

    7. Test for the slope of a least-squares regression line