



AP Statistics

Standards & Student Learning Targets

*The highlighted standards and student learning targets are assessed for mastery within the course. All other standards are introduced to students within the course.

Unit 1: Exploring Data

Student Learning Targets:

- I can identify the individuals and variables in a set of data.
- I can classify variables as categorical or quantitative.
- I can display categorical data with a bar graph and decide if it would be appropriate to make a pie chart.
- I can identify what makes some graphs of categorical data deceptive.
- I can calculate and display the marginal distribution of a categorical variable from a two-way table.
- I can calculate and display the conditional distribution of a categorical variable for a particular value of the other categorical variable in a two-way table.
- I can describe the association between two categorical variables by comparing appropriate conditional distributions.
- I can make and interpret dotplots and stemplots of quantitative data.
- I can describe the overall pattern of a distribution and identify any major departures from the pattern.
- I can identify the shape of a distribution from a graph as roughly symmetric or skewed.
- I can compare distributions of quantitative data using dotplots or stemplots.
- I can make and interpret histograms of quantitative data.
- I can compare distributions of quantitative data using histograms.
- I can calculate measures of center.
- I can calculate and interpret measures of spread.
- I can choose the most appropriate measure of center and spread in a given setting.
- I can identify outliers using the $1.5 \times \text{IQR}$ rule.
- I can make and interpret boxplots of quantitative data.
- I can use appropriate graphs and numerical summaries to compare distributions of quantitative variables.

Unit 2: Modeling Distributions of Data

Student Learning Targets

• I can find and interpret the percentile of an individual value within a distribution of data.
• I can estimate percentiles and individual values using a cumulative relative frequency graph.
• I can find and interpret the standardized score (z-score) of an individual value within a distribution of data.
• I can describe the effect of adding subtracting, multiplying by, or dividing by a constant on the shape, center, and spread of a distribution of data.
• I can estimate the relative locations of the median and mean on a density curve.
• I can use the 68-95-99.7 rule to estimate areas in a Normal distribution of data.
• I can use a table and/or technology to find the (i) proportion of z-values in a specified interval, or (ii) a z-score from a percentile in the standard Normal distribution.
• I can use a table and/or technology to find the (i) proportion of values in a specified interval, or (ii) the value that corresponds to a given percentile in the standard Normal distribution.
• I can determine if a distribution of data is approximately Normal from graphical and numerical evidence.
Unit 3: Describing Relationships
Student Learning Targets
• I can identify explanatory and response variables in situations where one variable helps to explain or influence the other.
• I can make a scatterplot to display the relationship between two quantitative variables.
• I can describe the direction, form, and strength of a relationship displayed in a scatterplot and recognize outliers in a scatterplot.
• I can interpret the correlation.
• I can understand the basic properties of correlation, including how the correlation is influenced by outliers.
• I can use technology to calculate correlation.
• I can interpret the slope and y-intercept of a least-squares regression line.
• I can use the least-squares regression line to predict y for a given x and explain the dangers of extrapolation.
• I can calculate and interpret residuals.
• I can explain the concept of least squares.
• I can determine the equation of a least-squares regression line using technology.
• I can construct and interpret residual plots to assess if a linear model is appropriate.
• I can interpret the standard deviation of the residuals and r^2 and use these values to assess how well the least-squares regression line models the relationship between two variables.

- I can describe how the slope, y intercept, standard deviation of the residuals and r^2 are influenced by outliers.
- I can explain why association does not imply causation.
- I can find the slope and y intercept of the least-squares regression line from the means and standard deviations of x and y and their correlation.

Unit 4: Designing Studies

Student Learning Targets

- I can identify the population and sample in a statistical study.
- I can identify voluntary response samples and convenience samples and explain how these sampling methods can lead to bias.
- I can describe how to obtain a random sample using slips of paper, technology, or a table or random digits.
- I can distinguish a simple random sample from a stratified random sample or cluster sample and give the advantages and disadvantages of each sampling method.
- I can explain how undercoverage, nonresponse, question wording, and other aspects of a sample survey can lead to bias.
- I can distinguish between an observational study and an experiment.
- I can explain the concept of confounding and how it limits the ability to make cause-and-effect conclusions.
- I can identify the experimental units, explanatory and response variables, and treatments.
- I can explain the purpose of comparison, random assignment, control and replication in an experiment.
- I can describe a completely randomized design for an experiment, including how to randomly assign treatments using slips of paper, technology, or a table or random digits.
- I can describe the placebo effect and the purpose of blinding in an experiment.
- I can interpret the meaning of statistically significant in the context of an experiment.
- I can explain the purpose of blocking in an experiment and describe a randomized block design or a matched pairs design for an experiment.
- I can describe the scope of inference that is appropriate in a statistical study.
- I can evaluate whether a statistical study has been carried out in an ethical manner.

Unit 5: Probability

Student Learning Targets

- I can interpret probability as a long-run relative frequency.
- I can use simulation to model chance behavior.

- I can determine a probability model for a chance process.

- I can use basic probability rules, including the complement rule and the addition rule for mutually exclusive events.

- I can use a two-way table or Venn diagram to model a chance process and calculate probabilities involving two events.

- I can use the general addition rule to calculate probabilities.

- I can calculate and interpret conditional probabilities.

- I can use the general multiplication rule to calculate probabilities.

- I can use tree diagrams to model a chance process and calculate probabilities involving two or more events.

- I can determine whether two events are independent.

- I can, when appropriate, use the multiplication rule for independent events to compute probabilities.

Unit 6: Random Variables

Student Learning Targets

- I can compute probabilities using the probability distribution of a discrete random variable.

- I can calculate and interpret the mean (expected value) of a discrete random variable.

- I can calculate and interpret the standard deviation of a discrete random variable.

- I can compute probabilities using the probability distribution of a continuous random variable.

- I can describe the effects of transforming a random variable by adding or subtracting a constant and multiplying or dividing by a constant.

- I can find the mean and standard deviation of the sum or difference of independent random variables.

- I can find probabilities involving the sum or difference of independent Normal random variables.

- I can determine whether the conditions for using a binomial random variable are met.

- I can compute and interpret probabilities involving binomial distributions.

- I can calculate the mean and standard deviation of a binomial random variable. Interpret these values in context.

- I can find probabilities involving geometric random variables.

Unit 7: Sampling Distributions

Student Learning Targets

- I can distinguish between a parameter and a statistic.

- I can use the sampling distribution of a statistic to evaluate a claim about a parameter.

I can distinguish among the distribution of a population, the distribution of a sample, and the sampling distribution of a statistic.
I can determine whether or not a statistic is an unbiased estimator of a population parameter.
I can describe the relationship between sample size and the variability of a statistic.
I can find the mean and standard deviation of the sampling distribution of a sample proportion $\hat{p}$. Check the 10% condition before calculating $\sigma_{\hat{p}}$.
I can determine if the sampling distribution of $\hat{p}$ is approximately Normal.
I can, if appropriate, use a Normal distribution to calculate probabilities involving $\hat{p}$.
I can find the mean and standard deviation of the sampling distribution of a sample mean $\bar{x}$ and check the 10% condition before calculating $\sigma_{\bar{x}}$.
I can explain how the shape of sampling distribution of $\bar{x}$ is affected by the shape of the population distribution and the sample size.
I can, if appropriate, use a Normal distribution to calculate probabilities involving $\bar{x}$.
Unit 8: Estimating with Confidence
Student Learning Targets
I can Determine the point estimate and margin of error from a confidence interval.
I can Interpret a confidence interval in context.
I can interpret a confidence level in context.
I can describe how the sample size and confidence level affect the length of a confidence interval.
I can explain how practical issues like nonresponse, undercoverage, and response bias can affect the interpretation of a confidence interval.
I can state and check the Random, 10%, and Large Counts conditions for constructing confidence interval for a population proportion.
I can determine critical values for calculating a C% confidence interval for a population proportion using a table or technology.
I can construct and interpret a confidence interval for a population proportion.
I can determine the sample size required to obtain a C% confidence interval for a population proportion with a specified margin of error.
I can state and check the Random, 10%, and Normal/Large Sample conditions for constructing a confidence interval for a population mean.
I can explain how the t distributions are different from the standard Normal distribution and why it is necessary to use a t distribution when calculating a confidence interval for a population mean.

- I can determine critical values for calculating a C% confidence interval for a population mean using a table or technology.
- I can construct and interpret a confidence interval for a population mean.
- I can determine the sample size required to obtain a C% confidence interval for a population mean with a specified margin of error.

Unit 9: Testing a Claim

Student Learning Targets

- I can state the null and alternate hypotheses for a significance test about a population parameter.
- I can interpret a P-value in context.
- I can determine if the results of a study are statistically significant and draw an appropriate conclusion using a significance level.
- I can interpret a Type I and a Type II error in context, and give a consequence of each.
- I can state and check the Random, 10%, and Large Counts conditions for performing a significance test about a population proportion.
- I can perform a significance test about a population proportion.
- I can interpret the power of a test and describe what factors affect the power of a test.
- I can describe the relationship among the probability of a Type I error (significance level), the probability of a Type II error, and the power of a test.
- I can state and check the Random, 10%, and Normal/Large Sample conditions for performing a significance test about a population mean.
- I can perform a significance test about a population mean.
- I can use a confidence interval to draw a conclusion for a two-sided test about a population parameter.
- I can perform a significance test about a mean difference using paired data.

Unit 10: Comparing Two Populations or Groups

Student Learning Targets

- I can describe the shape, center, and spread of the sampling distribution of $\hat{p}_1 - \hat{p}_2$.
- I can determine whether the conditions are met for doing inference about $p_1 - p_2$.
- I can construct and interpret a confidence interval to compare two proportions.
- I can perform a significance test to compare two proportions.
- I can describe the shape, center, and spread of the sampling distribution of $\bar{x}_1 - \bar{x}_2$.
- I can determine whether the conditions are met for doing inference for $\mu_1 - \mu_2$.

- I can construct and interpret a confidence interval to compare two means.
- I can perform a significance test to compare two means.
- I can determine when it is appropriate to use two-sample t procedures versus paired t procedures.

Unit 11: Inference for Distributions of Categorical Data

Student Learning Targets

- I can state appropriate hypotheses and compute expected counts for a chi-square test for goodness of fit.
- I can calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test for goodness of fit.
- I can perform a chi-square test for goodness of fit.
- I can conduct a follow-up analysis when the results of a chi-square test are statistically significant.
- I can compare conditional distributions for data in a two way table.
- I can state appropriate hypotheses and compute expected counts for a chi-square test based on data in a two-way table.
- I can calculate the chi-square statistic, degrees of freedom, and P-value for a chi-square test based on data in a two-way table.
- I can perform a chi-square test for homogeneity.
- I can perform a chi-square test for independence.
- I can choose the appropriate chi-square test.

Unit 12: More about Regression

Student Learning Targets

- I can check the conditions for performing inference about the slope β of the population (true) regression line.
- I can interpret the values of a , b , s , SE_b , and r^2 in context, and determine these values from computer output.
- I can construct and interpret a confidence interval for the slope β of the population (true) regression line.
- I can perform a significance test about this slope β of the population (true) regression line.
- I can use transformations involving powers and routes to find a power model that describes the relationship between two variables, and use the model to make predictions.
- I can use transformations involving logarithms to find a power model or an exponential model that describes a relationship between two variables, and use the model to make predictions.
- I can determine which of several transformations does a better job of producing a linear relationship.

