Ch. 1: Exploring Data
AP STATS Learning Targets

A. I can interpret and construct distribution displays for categorical data.
   a. I can identify individuals and variables in a data set.
   b. I can classify variables as categorical or quantitative.
   c. I can interpret a pie chart.
   d. I can construct and interpret a bar graph.
   e. I can interpret and construct two-way tables.
   f. I can identify what makes some graphs deceptive.
   g. I can determine the most appropriate display for a given data set.

B. I can describe the relationship between two categorical variables.
   a. I can calculate marginal and conditional distributions.
   b. I can organize a statistical problem.
   c. I can construct side-by-side bar graphs to display the relationship between two variables.

C. I can construct and interpret distribution displays for quantitative data.
   a. I can identify individuals and variables in a data set.
   b. I can classify variables as categorical or quantitative.
   c. I can identify units of measurement for a quantitative variable.
   d. I can identify what makes some graphs deceptive.
   e. I can construct and interpret dotplots, stemplots, and histograms.
   f. I can determine the most appropriate display for a given data set.

D. I can compare distributions for quantitative variables.
   a. I can describe the overall pattern of a distribution (shape, center, spread) and identify major departures from the pattern (outliers).
   b. I can identify the shape of a distribution as roughly symmetric or skewed.
   c. I can identify the number of modes and identify and gaps or clusters of data.
   d. I can construct a boxplot using a 5-number summary.
   e. I can determine which graphs and numerical summaries are appropriate to compare distributions of quantitative variables.

E. I can calculate and interpret numerical summaries for quantitative data.
   a. I can calculate and interpret the mean and median of a data set.
   b. I can calculate and interpret standard deviation and IQR.
   c. I can identify outliers.
   d. I can determine and justify which measure of center and which measure of spread is appropriate for a given distribution.

Ch. 2: Modeling Distributions of Data
AP STATS Learning Targets

A. I can measure position, using percentiles.
   a. I can use percentiles to locate individual values within distributions of data.
   b. I can calculate the percentile for a value in a distribution.

B. I can transform data.
   a. I can describe the effect adding, subtracting, multiplying by, or by a constant on the shape, center, and spread of a distribution of data.

C. I can measure position, using z-scores.
   a. I can find the standardized value (z-score) of an observation.
   b. I can interpret z-scores in context.

D. I can construct and interpret ogives.
   a. I can interpret a cumulative relative frequency graph.
   b. I can calculate relative frequency and relative cumulative frequency.

E. I can define and describe density curves.
   a. I can approximately locate the median (equal-areas point) and mean (balance point) on a density curve.
   b. I can explain why a curve is or is not a "density curve."

F. I can describe location in a normal distribution.
   a. I can explain the 68-95-99.7 rule (a.k.a. the Empirical Rule) and use it to solve problems.
   b. I can use the standard Normal distribution to calculate the proportion of values in a specified interval.
   c. I can make an appropriate graph to determine whether a distribution is bell-shaped.
   d. I can assess Normality of a data set.
   e. I can interpret a Normal probability plot.
   f. I can describe shape, center, and spread of the "Standard Normal Distribution."

Ch. 3: Describing Relationships
AP STATS Learning Targets

A. I can interpret scatterplots.
   a. I can identify explanatory and response variables.
   b. I can construct scatterplots to display relationships.
   c. I can examine a scatterplot for direction, form, strength, type of relationship, context, and outliers.

B. I can interpret correlation.
   a. I can measure linear association using correlation.
   b. I can calculate correlation to determine strength and direction of a linear association.
   c. I can interpret the properties of a calculated correlation.

C. I can interpret a regression line.
   a. I can calculate the equation for the least-squares regression line (LSRL) using a calculator AND using formulas.
   b. I can interpret the slope and y-intercept of a least-squares regression line in the context of the problem.
   c. I can determine how well a line fits observed data.
   d. I can interpret the coefficient of determination r^2 and describe its properties.
   e. I can make predictions based on the model.
   f. I can make statements about the accuracy of my predictions.
   g. I can explain the difference between an outlier and "influential observation" in the context of a paired data set.
   h. I can find r^2 and the LSRL slope and y-intercept in computer output.

D. I can construct and interpret residual plots.
   a. I can calculate residuals.
   b. I can explain what a residual is.
   c. I can determine how well a line fits observed data based on a residual plot.

A. **I can describe sampling methods and determine which type is most appropriate for a given situation. simple random samples, stratified random samples and cluster samples.**
   a. I can identify the population and sample in a sample survey.
   b. I can identify voluntary response samples and convenience samples.
   c. I can explain how bad sampling methods can lead to bias.
   d. I can identify simple random samples, stratified random samples, and cluster samples.
   e. I can give advantages and disadvantages of each sampling method.
   f. I can describe how to use a table of random digits to select a simple random sample (SRS).
   g. I can identify situations that involve a "lurking variable" and explain how it may impact the results.

B. **I can distinguish observational studies from experiments.**
   a. I can explain how under-coverage, nonresponse, and question wording can lead to bias in a sample survey.
   b. I can explain how a lurking variable in an observational study can lead to confounding.
   c. I can determine whether an association between two variables is caused by causation, common response, or confounding.
   d. I can describe a completely randomized design for an experiment.
   e. I can describe how to avoid the placebo effect in an experiment.
   f. I can explain the meaning and the purpose of blinding in an experiment.
   g. I can apply the three principles of experimental design.

C. **I can design comparative experiments utilizing completely randomized designs and randomized block designs, including matched pairs design.**
   a. I can distinguish between a completely randomized design and a randomized block design.
   b. I can explain why random assignment is an important experimental design principle.
   c. I can explain in context what "statistically significant" means.
   d. I know when a matched pairs experimental design is appropriate and how to implement such a design.

D. **I can use studies wisely.**
   a. I can describe the challenges of establishing causation.
   b. I can define the scope of inference.
   c. I can evaluate whether a statistical study has been carried out in an ethical manner.

Ch. 5: Probability
AP STATS Learning Targets

A. I can describe the idea of probability.
   a. I can describe myths about randomness.
   b. I can interpret probability as a long-run relative frequency.

B. I can design and perform simulations.
   a. I can assign digits to appropriately model given probabilities.
   b. I can describe the process for using a random digit table or other device to run trial of a simulation.
   c. I can calculate the probability estimate after running the simulation.

C. I can describe and calculate chance behavior with a probability model.
   a. I can define and apply basic rules of probability.
   b. I can determine probability from two-way tables and tree diagrams.
   c. I can construct Venn Diagrams and determine probabilities.
   d. I can use basic probability rules, including the complement rule and the addition rule for mutually exclusive events.
   e. I can use the general additional rule to calculate to union of events.

D. I can interpret and calculate conditional probabilities.
   a. I can define and compute conditional probabilities.
   b. I can find the probability that events occur using a two-way table and/or tree diagram.
   c. I can construct a two-way table and display the data in an appropriate graph.

E. I can describe independence.
   a. I can describe chance behavior with a tree diagram.
   b. I can define independent events.
   c. I can determine whether two events are independent using three different methods.
   d. I can apply the general multiplication rule to solve probability questions.

A. I can apply the concept of discrete random variables to a variety of settings.
   a. I can define a random variable.
   b. I can define a probability distribution.
   c. I can use a probability distribution to answer questions about possible values of a random variable.
   d. I can calculate and interpret the mean (expected variable) of a discrete random variable and explain what it measures.
   e. I can calculate and interpret the standard deviation (and variance) of a discrete random variable and explain what it measures.
   f. I can apply the law of large numbers to interpret the expected value and standard deviation of a random variable.

B. I can describe continuous random variables.
   a. I can explain the difference between discrete and continuous random variables.
   b. I can find probabilities in a continuous probability distribution.
   c. I can determine the probability distribution of an individual outcome in a continuous probability distribution.

C. I can describe the effect of performing a linear transformation on a discrete random variable.
   a. I can describe the effects of transforming a random variable by adding or subtracting a constant and multiply or dividing by a constant.
   b. I can calculate the mean, variance, and standard deviation of a random variable after a linear transformation has been applied.

D. I can combine random variables and calculate the resulting mean and standard deviation.
   a. I can determine if two random variables are independent.
   b. I can find the mean and standard deviation of the sum or difference of independent random variables.
   c. I can calculate and interpret probabilities involving combinations of Normal random variables.

E. I can compute and interpret probabilities involving binomial and geometric random variables.
   a. I can determine whether the conditions for a binomial/geometric setting have been met.
   b. I can calculate the mean and standard deviation of a binomial/geometric random variable and interpret these values in context.
   c. I can calculate probabilities involving geometric/binomial random variables.

Ch. 7: Sampling Distributions
AP STATS Learning Targets

A. I can define a sampling distribution.
   a. I can distinguish between a parameter and a statistic.
   b. I can determine whether a number in a problem is a parameter or a statistic.
   c. I can recognize and use symbols to differentiate between the sample and population mean, standard deviation, and proportion.
   d. I can distinguish between population distribution, sampling distribution, and the distribution of sample data.
   e. I can determine whether a statistic is an unbiased estimator of a population parameter.
   f. I can understand the relationship between sample size and the variability of an estimator.

B. I can evaluate a claim about a population proportion using the sampling distribution of the sample proportion.
   a. I can find the mean and standard deviation of the sampling distribution of a sample proportion and describe what these measure.
   b. I can differentiate between means and proportions in problems.
   c. I can determine whether or not it is appropriate to use a Normal approximation to calculate probabilities involving sample proportions.
   d. I can calculate probabilities involving the sample proportion.

C. I can evaluate a claim about a population mean using the sampling distribution of the sample mean.
   a. I can find the mean and standard deviation of the sampling distribution of a sample mean and describe what they measure.
   b. I can calculate probabilities involving a sample mean when the population distribution is Normal.
   c. I can explain how the shape of the sampling distribution of sample means is related to the shape of the population distribution.
   d. I can apply the central limit theorem to help find probabilities involving a sample mean.

Ch. 8: Estimating with Confidence
AP STATS Learning Targets

A. I can interpret confidence intervals.
   a. I can interpret a confidence level.
   b. I can interpret a confidence interval in context.
   c. I can describe how a confidence interval gives a range of plausible values for the parameter.
   d. I can explain what "95% confidence" (or any other confidence level) means.
   e. I can describe the inference conditions necessary to construct confidence intervals.
   f. I can explain practical issues that can affect the interpretation of a confidence interval.
   g. I can identify the estimate and margin of error in a confidence interval.

B. I can construct and interpret a confidence interval for a population proportion.
   a. I can determine the sample size required to obtain a level C confidence interval for a population proportion with a specified margin of error.
   b. I can describe how the margin of error of a confidence interval changes with the sample size and level of confidence C.
   c. I can do the write-up for a one-sample z interval using the Inference Toolbox, including:
      i. Stating what we are interested in.
      ii. Explaining whether the conditions have been met.
      iii. Showing how to calculate the interval.
      iv. Interpreting the interval.

C. I can construct and interpret a confidence interval for a population mean.
   a. I can determine the sample size required to obtain a level C confidence interval for a population mean with a specified margin of error.
   b. I can describe how the margin of error of a confidence interval changes with the sample size and level of confidence C.
   c. I can do the write-up for a one-sample z interval using the Inference Toolbox.
   d. I can do the write-up for a one-sample t interval using the Inference Toolbox.
   e. I can determine when to use a t procedure vs. a z procedure.
   f. I can describe how confidence intervals are affected by changes to the confidence level, population standard deviation, and sample size.
   g. I can determine when and which inference conditions are robust.

Ch. 9: Testing a Claim
AP STATS Learning Targets

A. I can describe the logic of statistical tests.
   a. I can state correct hypotheses for a significance test about a population proportion or mean.
   b. I can interpret P-values in context.
   c. I can interpret a Type I error and a Type II error in context, and give the consequences of each.
   d. I can understand the relationship between the significance level of a test, P(Type II error) , and power.

B. I can perform tests about population proportions.
   a. I can check conditions for carrying out a test about a population proportion.
   b. I can conduct a significance test about a population proportion.
   c. I can use a confidence interval to draw a conclusion for a two-sided test about a population proportion.

C. I can perform tests about population means.
   a. I can check conditions for carrying out a test about a population mean.
   b. I can conduct a one-sample t test about a population mean.
   c. I can determine sample statistics from a confidence interval.
   d. I can use a confidence interval to draw a conclusion for a two-sided test about a population mean.
   e. I can perform significance tests for paired data.

Ch. 10: Comparing Two Populations
AP STATS Learning Targets

A. **I can perform an inference procedure to compare two population proportions**.
   a. I can describe the characteristics of the sampling distribution of $\widehat{p_1} - \widehat{p_2}$.
   b. I can determine whether the conditions of performing inference are met.
   c. I can construct and interpret a confidence interval to compare two proportions.
   d. I can perform a significance test to compare two proportions.
   e. I can interpret the results of inference procedures in a randomized experiment.

B. **I can perform an inference procedure to compare two population means.**
   a. I can describe the characteristics of the sampling distribution of $\overline{x_1} - \overline{x_2}$.
   b. I can determine whether the conditions of performing inference are met.
   c. I can use two-sample t procedures to compare two means based on summary statistics or raw data.
   d. I can interpret standard computer output for two-sample t procedures.
   e. I can perform a significance test to compare two means.
   f. I can check conditions for using two-sample t procedures in a randomized experiment.
   g. I can interpret the results of inference procedures in a randomized experiment.

C. **I can determine the proper inference procedure to use in a given setting.**

Ch. 11: Inference for Categorical Data
AP STATS Learning Targets

A. I can perform a chi-square goodness of fit test.
   a. I can compute expected counts, conditional distribution, and contributions to the chi-square statistic.
   b. I can determine whether the conditions of performing a chi-square test are met.
   c. I can examine individual components of a chi-square statistic as part of follow-up analysis.

B. I can perform an inference procedure for distributions of categorical data.
   a. I can perform a chi-square test for homogeneity to determine whether the distribution of categorical variables differ for several populations or treatments.
   b. I can perform a chi-square test for association/independence to determine whether there is convincing evidence of an association between to categorical variables.
   c. I can interpret computer output for a chi-square test based on a two-way table.

Ch. 12: Regression
AP STATS Learning Targets

A. I can perform an inference procedure for a linear regression.
   a. I can check conditions for performing inference about the slope β of a population regression line.
   b. I can construct and interpret a confidence interval for the slope β of a population regression line.
   c. I can perform a significance test about the slope β of a population regression line.
   d. I can interpret computer output of a least-squares regression analysis.

B. I can use transformations to achieve linearity for a relationship between two variables.
   a. I can use transformations involving powers and roots to achieve linearity for a relationship between two variables.
   b. I can make predictions from a least-squares regression line involving transformed data.
   c. I can use transformations involving logarithms to achieve linearity for a relationship between two variables.
   d. I can determine which of several transformations does a better job of producing linearity.