

AP Statistics

Data Analysis & Probability Standard: Understands and applies concepts of data analysis and probability.				
Power Benchmark 1: Formulates questions that can be addressed with data and collects, organizes, and displays relevant data to answer them.				
Course Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Knows and applies methods of data collection	<ul style="list-style-type: none"> • Census • Sample • Experiment • Study • Observational study • Prospective study • Retrospective study 		<ul style="list-style-type: none"> • Census - • Sample Survey - • Experiment - • Observational Study 	
b. Plans and conducts surveys	<ul style="list-style-type: none"> • Population • Sample • Random selection • Simple random sampling • Sampling frame • Bias (various forms) • Sampling variability 		<ul style="list-style-type: none"> • Characteristics of a well-designed, well-conducted survey - • Populations, samples, and random selection - • Sources of bias in surveys - • Simple Random Sampling - • Stratified random sampling - 	

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c. Plans and conducts experiments	<ul style="list-style-type: none"> Factor Treatment Control group Bias (various forms) Placebo Blinding Blocks Matched-pairs Confounding 		<ul style="list-style-type: none"> Characteristics of a well-designed, 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 - 	
Power Benchmark 2: Selects and uses appropriate statistical methods to analyze data				
a. Interprets graphical displays of distributions of univariate data	<ul style="list-style-type: none"> Center Spread Outlier Shape Dot plot Stem plot Histogram Cumulative frequency plot 	<ul style="list-style-type: none"> Reads charts and graphs 	<ul style="list-style-type: none"> Center and spread - Clusters and gaps - Outliers and other unusual features - Shape - 	
b. Interprets categorical data.	<ul style="list-style-type: none"> Marginal frequency Joint frequency Frequency table Contingency table 	<ul style="list-style-type: none"> Organizes data 	<ul style="list-style-type: none"> Marginal & joint frequencies for two-way tables- Conditional relative frequencies and association- 	

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c. Recognizes and explains the Normal distribution and evaluates its applicability to various scenarios	<ul style="list-style-type: none"> • Normal distribution • Mean • Standard deviation • Z-score • Percentile • T-distribution • Degrees of freedom 	<ul style="list-style-type: none"> • Finds mean • Finds standard deviation • Interprets histograms 	<ul style="list-style-type: none"> • Properties of the Normal distribution - • Using tables of the Normal distribution - • The Normal distribution as a model for measurements - • t-distribution - • Single-sample t-procedures - • Two-sample t-procedures - 	
d. Recognizes sampling distributions and applies them to given situations	<ul style="list-style-type: none"> • Central Limit Theorem • Sampling distribution • Standard error • Proportion • Mean 	<ul style="list-style-type: none"> • Understands normal distribution • Understands sampling 	<ul style="list-style-type: none"> • 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 - 	

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e. Summarizes distributions of univariate data.	<ul style="list-style-type: none"> • Mean • Median • Range • IQR • Standard Deviation • Quartiles • Minimum • Maximum • Outlier • Box plot 	<ul style="list-style-type: none"> • Creates and interprets stem plots and histograms 	<ul style="list-style-type: none"> • Measuring center - • Measuring spread - • Measuring position - • Using box plots - • Effect of changing units on summary measures - 	
f. Compares distributions of univariate data.	<ul style="list-style-type: none"> • Back-to-back stem plot • Parallel box plots 	<ul style="list-style-type: none"> • Creates and interprets stem plots, box plots, and histograms 	<ul style="list-style-type: none"> • Comparing center and spread • Comparing clusters and gaps • Comparing outliers and other unusual features - • Comparing shapes - 	
g. Analyzes bivariate data.	<ul style="list-style-type: none"> • Scatterplot • Correlation • Regression • Least squares regression • Residual • Transformation • Influential points • Interpolation • Extrapolation • Lurking variable 	<ul style="list-style-type: none"> • Understands slope-intercept form of a line • Understands slope • Understands intercepts • Understands plotting points • Understands logarithms, exponentials, square roots, quadratics, reciprocals 	<ul style="list-style-type: none"> • Analyzes patterns in scatterplots - • Correlation and linearity - • Least squares regression line - • Residual plots, outliers, and influential points - • Transformations to achieve linearity - 	

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h. Combines independent random variables	<ul style="list-style-type: none"> • Random variable • Independent • Dependent • Discrete random variable • Continuous random variable 	<ul style="list-style-type: none"> • Understands probability • Understands mean • Understands standard deviation 	<ul style="list-style-type: none"> • Notion of independence versus dependence - • Notion of independence versus dependence - 	
Power Benchmark 3: Develops and evaluates inferences and predictions that are based on data				
a. Computes confidence intervals and draws conclusions based on results	<ul style="list-style-type: none"> • Confidence interval • Margin of error • Critical value 	<ul style="list-style-type: none"> • Understands \pm symbol • Understands interval notation • Understands mean • Understands standard deviation 	<ul style="list-style-type: none"> • Meaning of a confidence interval - • Meaning of a confidence interval - • 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 - 	

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b. Constructs tests of significance and makes inferences about the population based upon the results	<ul style="list-style-type: none"> • Null hypothesis • Alternative hypothesis • P-value • One-sided test • Two-sided test • Type-I error • Type-II error • Chi-square test • Homogeneity • Power • Significance level • Statistically significant • Pooling • Goodness of fit 	<ul style="list-style-type: none"> • Understands confidence Interval • Understands normal distribution 	<ul style="list-style-type: none"> • Logic of significance testing, null and alternative hypotheses, P-values, one- and two-sided tests, Type-I and Type-II errors, and power - • Large sample tests for proportions -- • Large sample tests for means - • Large sample test for a difference between two proportions - • Large sample test for a difference between two means - • Chi-Square test for goodness of fit, homogeneity of proportions and independence - 	

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c. Applies inference to normally distributed data	<ul style="list-style-type: none"> Residual standard deviation Mean predicted value 	<ul style="list-style-type: none"> Understands normal distributions Understands least squares regression Understands hypothesis testing Understands confidence Intervals Understands standard Error 	<ul style="list-style-type: none"> Inference for the slope of a least squares regression line - 	
Power Benchmark 4: Understands and applies concepts of probability				
a. Describes probability as a relative frequency	<ul style="list-style-type: none"> Frequency Relative frequency Expected value Law of Large numbers Probability Complement Binomial Theorem 	<ul style="list-style-type: none"> Uses Venn diagrams 	<ul style="list-style-type: none"> Law of large numbers concept - Discrete random variables and their probability distributions - Simulation of probability distributions - 	
b. Applies properties of probability	<ul style="list-style-type: none"> Conditional probability Independent Dependent Mutually exclusive Addition rule Multiplication rule 	<ul style="list-style-type: none"> Uses Venn diagrams Finds simple probabilities 	<ul style="list-style-type: none"> Addition rule, multiplication rule, conditional probability, and independence - Mean and standard deviation of a random variable - 	

Communication Standard: Communicates and reasons mathematically				
Power Benchmark 1: Expresses ideas using mathematical terms and representations.				
Course Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Uses statistical terms to describe various problems and situations	<ul style="list-style-type: none"> (See other benchmarks) 	<ul style="list-style-type: none"> Explains problems and situations accurately 	<ul style="list-style-type: none"> Uses appropriate statistical terms in describing distributions, inference procedures, experimental design, etc. - 	
Power Benchmark 2: Uses tools (such as technology) to enhance mathematical learning				
a. Uses the graphing calculator to explore data	<ul style="list-style-type: none"> Tests Distributions Plots Window Home screen 	<ul style="list-style-type: none"> Graphs basic functions Uses basic operations, menu usage, etc. 	<ul style="list-style-type: none"> Displays of univariate statistics - Least squares regression - Distributions, tests, confidence intervals - 	
b. Uses computer software to explore data	<ul style="list-style-type: none"> Tests Distributions Plots Window 	<ul style="list-style-type: none"> Uses Windows software Formats and uses a basic spreadsheet 	<ul style="list-style-type: none"> Displays of univariate statistics - Least squares regression - Distributions, tests, confidence intervals - 	