

Bemidji Area Schools
Outcomes in Mathematics – AP Statistics

Unit 1: 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.

Number of Days	Chapter	AP Course Description Topic
4	<p>Chapter 1 Stats Starts Here</p> <ul style="list-style-type: none"> • Introduction to Statistics, Data, and Variation. <p>Chapter 2 Data</p> <ul style="list-style-type: none"> • Analyzing Data – Who, What, When, Where, Why, How • Categorical vs. Quantitative Variables • TI: Entering data and working with data lists <p>Chapter 3 Displaying and Describing Categorical Data</p> <ul style="list-style-type: none"> • Frequency and Relative Frequency Tables • Distributions of Categorical Variables • Importance of the Area Principle • Bar and Pie Charts • Contingency Tables • Marginal and Conditional Distributions • Independence of Categorical Variables • Segmented Bar Charts • Simpson’s Paradox 	<p>I. Exploring Data</p> <p>A. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)</p> <ol style="list-style-type: none"> 1. Center and spread 2. Clusters and gaps 3. Outliers and other unusual features 4. Shape <p>B. Summarizing distributions of univariate data</p> <ol style="list-style-type: none"> 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 <p>C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)</p> <ol style="list-style-type: none"> 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 <p>D. Exploring bivariate data</p> <ol style="list-style-type: none"> 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 <p>E. Exploring categorical data</p> <ol style="list-style-type: none"> 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

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<p>Chapter 4 Displaying Quantitative Data</p> <ul style="list-style-type: none">• Distributions of Quantitative Variables• Frequency and Relative Frequency Histograms• Stem-and-Leaf Displays• Dotplots• Describing a Distribution in terms of shape, outliers, center, and spread (SOCS)• Shape: Modality, Uniformity, Symmetry, Skewness, Unusual Observations, Gaps, and Clusters• Center and Spread in General Terms• Comparing Distributions• Timeplots• TI: Creating a Histogram <p>Chapter 5 Describing Distributions Numerically</p> <p>Chapter 6 The Standard Deviation as a Ruler and the Normal Model</p>	
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Unit II: Exploring Relationships Between Variables: Exploring Data: Describing patterns and departures from patterns (20%–30%) <i>From careful observations of patterns in data, students can generate conjectures about relationships among variables. The notion of how one variable may be associated with another permeates almost all of statistics, from simple comparisons of proportions through linear regression. The difference between association and causation must accompany this conceptual development throughout</i>		
Number of Days	Chapter	AP Course Description Topic
2	Chapter 7 Scatterplots, Association, and Correlation	<i>I. Exploring Data</i> D. Exploring bivariate data <ol style="list-style-type: none"> 1. Analyzing patterns in scatterplots 2. Correlation and linearity
2	Chapter 8 Linear Regression	<i>I. Exploring Data</i> D. Exploring bivariate data <ol style="list-style-type: none"> 3. Least-squares regression line
2	Chapter 9 Regression Wisdom	<i>I. Exploring Data</i> D. Exploring bivariate data <ol style="list-style-type: none"> 4. Residual plots, outliers, and influential points
1	Chapter 10 Re-expressing Data	<i>I. Exploring Data</i> D. Exploring bivariate data <ol style="list-style-type: none"> 5. Transformations to achieve linearity: logarithmic and power transformations

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Unit III – Gathering Data “*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. Data must be collected according to a well-developed plan if valid information is to be obtained. If data are to be collected to provide an answer to a question of interest, a careful plan must be developed. Both the type of analysis that is appropriate and the nature of conclusions that can be drawn from that analysis depend in a critical way on how the data was collected. Collecting data in a reasonable way, through either sampling or experimentation, is an essential step in the data analysis process. (“AP Statistics Course Description”, The College Board, p. 6.)*

Number of Days	Chapter	AP Course Description Topic
1	Chapter 11 Understanding Randomness	III. Anticipating Patterns A. Probability 5. Simulation of random behavior and probability distributions
3	Chapter 12 Sample Surveys	II. Sampling and Experimentation: Planning and conducting a 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
6	Chapter 13 Experiments	II. Sampling and Experimentation: Planning and conducting a study A. Overview of methods of data collection 3. Experiment 4. Observational study 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 sampling, and cluster sampling

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Unit IV: Randomness and Probability “Statistical Inference: Estimating population parameters and testing hypotheses (30%–40%) *Statistical inference guides the selection of appropriate models. Probability is the tool used for anticipating what the distribution of data should looklike under a given model.* Random phenomena are not haphazard: they display an order that emerges only in the long run and is described by a distribution. The mathematical description of variation is central to statistics. The probability required for statistical inference is not primarily axiomatic or combinatorial but is oriented toward using probability distributions to describe data. (“AP Statistics Course Description”, The College Board, p. 6)

Number of Days	Chapter	AP Course Description Topic
3	Chapter 14 From Randomness to Probability	III. Anticipating Patterns A. Probability <ol style="list-style-type: none"> 1. Interpreting probability, including long-run relative frequency interpretation 2. “Law of Large Numbers” concept 3. Addition rule, multiplication rule, conditional probability, and Independence
3	Chapter 15 Probability Rules!	III. Anticipating Patterns A. Probability <ol style="list-style-type: none"> 3. Addition rule, multiplication rule, conditional probability, and Independence
2	Chapter 16 Random Variables	III. Anticipating Patterns A. Probability <ol style="list-style-type: none"> 4. Discrete random variables and their probability distributions, including binomial and geometric 6. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable B. Combining independent random variables <ol style="list-style-type: none"> 1. Notion of independence versus dependence 2. Mean and standard deviation for sums and differences of independent random variables
2	Chapter 17 Probability Models	III. Anticipating Patterns A. Probability <ol style="list-style-type: none"> 4. Discrete random variables and their probability distributions, including binomial and geometric

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Unit V – From the Data at Hand to the World at Large: Sampling Distributions and Statistical Inference “ <i>Statistical Inference: Estimating population parameters and testing hypotheses (30%–40%)</i> . Statistical inference guides the selection of appropriate models. Models and data interact in statistical work: models are used to draw conclusions from data, while the data are allowed to criticize and even falsify the model through inferential and diagnostic methods. Inference from data can be thought of as the process of selecting a reasonable model, including a statement in probability language, of how confident one can be about the selection. (“AP Statistics Course Description”, The College Board, p. 6)		
Number of Days	Chapter	AP Course Description Topic
4	Chapter 18 Sampling Distribution Models	III. Anticipating Patterns D. Sampling distributions <ol style="list-style-type: none"> 1. Sampling distribution of a sample proportion 2. Sampling distribution of a sample mean 3. Central Limit Theorem
4	Chapter 19 Confidence Intervals for Proportions	IV. Statistical Inference A. Estimation (point estimators and confidence intervals) <ol style="list-style-type: none"> 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
4	Chapter 20 Testing Hypotheses about Proportions	IV. Statistical Inference B. Tests of significance <ol style="list-style-type: none"> 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
2	Chapter 21 More About Tests	IV. Statistical Inference B. Tests of significance <ol style="list-style-type: none"> 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
3	Chapter 22 Comparing Proportions	III. Anticipating Patterns D. Sampling distributions <ol style="list-style-type: none"> 4. Sampling distribution of a difference between two independent sample proportions IV. Statistical Inference B. Tests of significance <ol style="list-style-type: none"> 3. Large sample test for a difference between two proportions

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Unit VI: Learning about the World <i>Statistical inference guides the selection of appropriate models.</i> Models and data interact in statistical work: models are used to draw conclusions from data, while the data are allowed to criticize and even falsify the model through inferential and diagnostic methods. Inference from data can be thought of as the process of selecting a reasonable model, including a statement in probability language, of how confident one can be about the selection.		
Number of Days	Chapter	AP Course Description Topic
3	Chapter 23 Inferences about Means	III. Anticipating Patterns D. Sampling distributions 7. t-distribution IV. Statistical Inference A. Estimation (point estimators and confidence intervals) 6. Confidence interval for a mean B. Tests of significance 4. Test for a mean
3	Chapter 24 Comparing Means	III. Anticipating Patterns D. Sampling distributions 5. Sampling distribution of a difference between two independent sample means IV. Statistical Inference A. Estimation (point estimators and confidence intervals) 7. Confidence interval for a difference between two means (unpaired and paired) B. Tests of significance 5. Test for a difference between two means (unpaired and paired)
4	Chapter 25 Paired Samples and Blocks	IV. Statistical Inference A. Estimation (point estimators and confidence intervals) 7. Confidence interval for a difference between two means (unpaired and paired) B. Tests of significance 5. Test for a difference between two means (unpaired and paired)

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Unit VII: Inferences When Variables are Related		
Number of Days	Chapter	AP Course Description Topic
4	Chapter 26 Comparing Counts	<p>III. Anticipating Patterns D. Sampling distributions 8. Chi-square distribution</p> <p>IV. Statistical Inference B. Tests of significance 6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)</p>
3	Chapter 27 Inference for Regression	<p>IV. Statistical Inference A. Estimation (point estimators and confidence intervals) 8. Confidence interval for the slope of a least-squares regression line</p> <p>B. Tests of significance 7. Test for the slope of a least-squares regression line</p>