

# Statistics in Action

## Correlations to AP Statistics

### AP Statistics Topic Outline Correlated to *Statistics in Action*

AP Statistics Topic (2007–2008 Topic Outline)	Section
<b>I. Exploring Data:</b> Describing patterns and departures from patterns <i>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.</i>	
<b>A. Constructing and interpreting graphical displays of distributions of univariate data (dot plot, stemplot, histogram, cumulative frequency plot)</b>	2.1–2.4
1. Center and spread	2.1–2.4
2. Clusters and gaps	2.1, 2.2
3. Outliers and other unusual features	2.1, 2.3, 2.4
4. Shape	2.1
<b>B. Summarizing distributions</b>	2.1, 2.3, 2.4, 2.5
1. Measuring center: median, mean	2.3, 2.4
2. Measuring spread: range, interquartile range, standard deviation	2.3, 2.4
3. Measuring position: quartiles, percentiles, standardized scores (z-scores)	2.1, 2.3, 2.4, 2.5
4. Using boxplots	2.3
5. The effect of changing units on summary measures	2.4
<b>C. Comparing distributions of univariate data (dot plots, back-to-back stemplots, parallel boxplots)</b>	2.1–2.3, 4.4, 9.5
1. Comparing center and spread: within group, between group variation	2.1–2.3, 4.4, 9.4
2. Comparing clusters and gaps	2.1–2.3
3. Comparing outliers and other unusual features	2.1–2.3
4. Comparing shapes	2.1–2.3
<b>D. Exploring bivariate data</b>	3.1–3.5
1. Analyzing patterns in scatterplots	3.1
2. Correlation and linearity	3.1–3.3
3. Least-squares regression line	3.2
4. Residual plots, outliers, and influential points	3.4
5. Transformations to achieve linearity: logarithmic and power transformations	3.5
<b>E. Exploring categorical data</b>	2.2, 10.2, 10.3
1. Frequency tables and bar charts	2.2, 10.2, 10.3
2. Marginal and joint frequencies for two-way tables	10.2, 10.3
3. Conditional relative frequencies and association	10.3
4. Comparing distributions using bar charts	2.2, 10.2, 10.3

AP Statistics Topic (2007–2008 Topic Outline)	Section
<b>II. Sampling and Experimentation:</b> Planning and conducting a study <i>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.</i>	
<b>A. Overview of methods of data collection</b>	4.1, 4.3
1. Census	4.1
2. Sample survey	4.1
3. Experiment	4.3
4. Observational study	4.3
<b>B. Planning and conducting surveys</b>	4.1, 4.2
1. Characteristics of a well-designed and well-conducted survey	4.1, 4.2
2. Populations, samples, and random selection	4.1, 4.2
3. Sources of bias in sampling and surveys	4.1
4. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling	4.2
<b>C. Planning and conducting experiments</b>	4.3, 4.4
1. Characteristics of a well-designed and well-conducted experiment	4.3, 4.4
2. Treatments, control groups, experimental units, random assignments, and replication	4.3
3. Sources of bias and confounding, including placebo effect and blinding	4.3
4. Completely randomized design	4.4
5. Randomized block design, including matched pairs design	4.4
<b>D. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys</b>	4.1–4.4
<b>III. Anticipating Patterns:</b> Exploring random phenomena using probability and simulation <i>Probability is the tool used for anticipating what the distribution of data should look like under a given model.</i>	
<b>A. Probability</b>	5.1, 5.3–5.5, 6.1–6.3, 7.1
1. Interpreting probability, including long-run relative frequency interpretation	5.1
2. “Law of Large Numbers” concept	5.1
3. Addition rule, multiplication rule, conditional probability, and independence	5.3–5.5, 6.1
4. Discrete random variables and their probability distributions, including binomial and geometric	6.2, 6.3
5. Simulation of random behavior and probability distributions	6.2, 6.3, 7.1
6. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable	6.1–6.3
<b>B. Combining independent random variables</b>	5.5, 6.4, 7.1
1. Notion of independence versus dependence	5.5, 6.1
2. Mean and standard deviation for sums and differences of independent random variables	6.1

AP Statistics Topic (2007–2008 Topic Outline)	Section
<b>C. The normal distribution</b>	2.1, 2.5
1. Properties of the normal distribution	2.1, 2.5
2. Using tables of the normal distribution	2.5
3. The normal distribution as a model for measurements	2.1, 2.5
<b>D. Sampling distributions</b>	7.1–7.3, 8.3, 8.4, 9.1–9.4, 10.1–10.3
1. Sampling distribution of a sample proportion	7.3
2. Sampling distribution of a sample mean	7.2
3. Central Limit Theorem	7.2
4. Sampling distribution of a difference between two independent sample proportions	8.3, 8.4
5. Sampling distribution of a difference between two independent sample means	9.4
6. Simulation of sampling distributions	7.1
7. <i>t</i> -distribution	9.1–9.3
8. Chi-square distribution	10.1–10.3
<b>IV. Statistical Inference:</b> Estimating population parameters and testing hypotheses <i>Statistical inference guides the selection of appropriate models.</i>	
<b>A. Estimation (point estimators and confidence intervals)</b>	7.1, 8.1, 8.3, 9.1, 9.3–9.5, 11.2
1. Estimating population parameters and margins of error	8.1, 9.1
2. Properties of point estimators, including unbiasedness and variability	7.1
3. Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals	8.1, 9.1
4. Large sample confidence interval for a proportion	8.1
5. Large sample confidence interval for a difference between two proportions	8.3
6. Confidence interval for a mean	9.1, 9.3
7. Confidence interval for a difference between two means (unpaired and paired)	9.4, 9.5
8. Confidence interval for the slope of a least squares regression line	11.2
<b>B. Tests of significance</b>	8.2, 8.4, 9.2–9.6, 10.1–10.3, 11.2
1. Logic of significance testing, null and alternative hypotheses; <i>P</i> -values; one- and two-sided tests; concepts of Type I and Type II errors; concept of power	8.2, 9.2
2. Large sample test for a proportion	8.2
3. Large sample test for a difference between two proportions	8.4
4. Test for a mean	9.2–9.5
5. Test for a difference between two means (unpaired and paired)	9.4, 9.5
6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)	10.1–10.3
7. Test for the slope of a least squares regression line	11.2

<b>Statistics in Action Section</b>	<b>AP Statistics Topics</b>
<b>Chapter 1: Statistical Reasoning: Investigating a Claim of Discrimination</b>	
Chapter 1 is an informal introduction to several statistical concepts. Students will be introduced to these AP Statistics Topics.	IA2, IA3, IB1, IC2, IC3, IIIA5, IIID2, IIID6
<b>Chapter 2: Exploring Distributions</b>	
<b>2.1</b> Visualizing Distributions: Shape, Center, and Spread	IA1, IA2, IA3, IA4, IB3, IC1, IC2, IC3, IC4, IIIC1, IIIC3
<b>2.2</b> Graphical Displays of Distributions	IA1, IA2, IC1, IC2, IC3, IC4, IE1, IE4
<b>2.3</b> Measures of Center and Spread	IA1, IA3, IB1, IB2, IB3, IB4, IC1, IC2, IC3, IC4
<b>2.4</b> Working With Summary Statistics	IA1, IA3, IB1, IB2, IB3, IB5
<b>2.5</b> The Normal Distribution	IB3, IIIC1, IIIC2, IIIC3
<b>Chapter 3: Relationships Between Two Quantitative Variables</b>	
<b>3.1</b> Scatterplots	ID1, ID2
<b>3.2</b> Getting a Line on the Pattern	ID2, ID3
<b>3.3</b> Correlation: The Strength of a Linear Trend	ID2
<b>3.4</b> Diagnostics: Looking for Features That the Summaries Miss	ID4
<b>3.5</b> Shape-Changing Transformations	ID5
<b>Chapter 4: Sample Surveys and Experiments</b>	
<b>4.1</b> Why Take Samples, and How Not To	IIA1, IIA2, IIB1, IIB2, IIB3, IID
<b>4.2</b> Random Sampling: Playing it Safe by Taking Chances	IIB1, IIB2, IIB4, IID
<b>4.3</b> Experiments and Inference About Cause	IIA3, IIA4, IIC1, IIC2, IIC3, IID
<b>4.4</b> Designing Experiments to Reduce Variability	IC1, IIC1, IIC4, IIC5, IID
<b>Chapter 5: Probability Models</b>	
<b>5.1</b> Constructing Models of Random Behavior	IIIA1, IIIA2
<b>5.2</b> Using Simulation to Estimate Probabilities	IIIA5
<b>5.3</b> The Addition Rule and Disjoint Events	IIIA3
<b>5.4</b> Conditional Probability	IIIA3
<b>5.5</b> Independent Events	IIIA3, IIIB1
<b>Chapter 6: Probability Distributions</b>	
<b>6.1</b> Random Variables and Expected Value	IIIA3, IIIA6, IIIB1, IIIB2
<b>6.2</b> The Binomial Distribution	IIIA4, IIIA5, IIIA6
<b>6.3</b> The Geometric Distribution	IIIA4, IIIA5, IIIA6
<b>Chapter 7: Sampling Distributions</b>	
<b>7.1</b> Generating Sampling Distributions	IIIA5, IIID6, IVA2
<b>7.2</b> Sampling Distribution of the Sample Mean	IIID2, IIID3
<b>7.3</b> Sampling Distribution of the Sample Proportion	IIID1

<b>Statistics in Action Section</b>	<b>AP Statistics Topics</b>
<b>Chapter 8: Inference for Proportions</b>	
<b>8.1</b> Estimating a Proportion with Confidence	IVA1, IVA3, IVA4
<b>8.2</b> Testing a Proportion	IVB1, IVB2
<b>8.3</b> A Confidence Interval for the Difference of Two Proportions	IIID4, IVA5
<b>8.4</b> A Significance Test for the Difference of Two Proportions	IIID4, IVB1, IVB3
<b>8.5</b> Inference for Experiments	IVB1
<b>Chapter 9: Inference for Means</b>	
<b>9.1</b> A Confidence Interval for a Mean	IVA1, IVA3, IVA6, IIID7
<b>9.2</b> A Significance Test for a Mean	IVB1, IVB4, IIID7
<b>9.3</b> When Things Aren't Normal	IIID7, IVA6, IVB4
<b>9.4</b> Inference for the Difference Between Two Means	IC1, IIID5, IVA7, IVB4, IVB5
<b>9.5</b> Paired Comparisons	IVA7, IVB4, IVB5
<b>Chapter 10: Chi-Square Tests</b>	
<b>10.1</b> Testing a Probability Model: The Chi-Square Goodness-of-Fit Test	IIID8, IVB6
<b>10.2</b> The Chi-Square Test of Homogeneity	IE1, IE2, IE4, IIID8, IVB6
<b>10.3</b> The Chi-Square Test of Independence	IE1, IE2, IE3, IE4, IIID8, IVB6
<b>Chapter 11: Inference for Regression</b>	
<b>11.1</b> Variation in the Slope from Sample to Sample	(prerequisite for IVA8 and IVB7)
<b>11.2</b> Making Inferences About Slopes	IVA8, IVB7
<b>11.3</b> Transforming for a Better Fit	ID5
<b>Chapter 12: Case Studies</b>	
Chapter 12 provides four case studies that give students open-ended opportunities to apply everything that they have learned. With this chapter, it is possible to review nearly all of the AP Statistics Topics.	