PASSAIC COUNTY TECHNICAL INSTITUTE
45 Reinhardt Road
Wayne, NJ

AP STATISTICS CURRICULUM
Course # 0445
5 Credits
2017

I. Course Description

The AP Statistics course is equivalent to a one-semester, introductory, non-calculus-based college course in statistics. The course is an excellent option for any secondary school student who has successfully completed a second-year course in algebra and who possesses suffcient mathematical maturity and quantitative reasoning ability. Because second-year algebra is the prerequisite course, AP Statistics usually will be taken in either the junior or senior year.The course introduces students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data.There are four themes in the AP Statistics course: exploring data, sampling and experimentation, anticipating patterns, and statistical inference. Students use technology, investigations, problem solving, and writing as they build conceptual understanding. Students who successfully complete the course and exam may receive credit, advanced placement or both for a one-semester introductory college statistics course.

II. PCTI Curriculum Unit Planner

Unit 1

Content Area:	**AP Statistics**	**Grade(s)**	**10, 11 & 12**
Unit Plan Title:	**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* **I.** Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot) (6 days) 1. Center and spread 2. Clusters and gaps 3. Outliers and other unusual features 4. Shape **II.** Summarizing distributions of univariate data (10 days) 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

III. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots) (8 days)

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

IV. Exploring bivariate data (10 days)

1. Analyzing patterns in scatterplots
2. Correlation and linearity
3. Least-squares regression line
4. Residual plots, outliers and in uential points
5. Transformations to achieve linearity: logarithmic and power transformations

V. Exploring categorical data (10 days)

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

NJSLS Standard(s) Addressed in this unit

S-ID A 1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID A 2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S-ID A 3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

S-ID A 4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas

under the normal curve.

S-ID B 5. Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

S-ID B 6. Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.

S-ID B 6. a. Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. *Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.*

S-ID B 6. b. Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.

S-ID B 6. c. Fit a linear function for a scatter plot that suggests a linear association.

S-ID C 7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

S-ID C 8. Compute (using technology) and interpret the correlation coefficient of a linear fit.

S-ID C 9. Distinguish between correlation and causation.

Essential Questions (3-5)

1. What are the important characteristics of data that are important?
2. Why should data be summarized and displayed?
3. What kind of insight into the data do we get from different displays?
4. Why is it important to find a data set's center?
5. Why are there different measures of center and variation, and when is it best to use each one?

Anchor Text

An Introduction to Statistics and Data Analysis Authors : Roxy Peck; Chris Olsen; Jay L. Devore, 5th Edition, AP Edition
ISBN: **9781305267244**

Informational Texts (3-5)

Bock, David E., Paul F. Velleman, and Richard D. DeVeaux. *Stats: Modeling the World*. Boston: Pearson.
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Short Texts (1-3)

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Formative & Summative Assessments

Formative Assessment

- Homework
- Quiz
- Chapter test
- Classwork

Summative Assessment

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Resources (websites, Canvas, LMS, Google Classroom, documents, etc.)

TI Nspire Cas Graphing Calculator
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https://www.khanacademy.org/math/statistics-probability **https://www.desmos.com/calculator** **http://apcentral.collegeboard.com/apc/members/exam/exam_information/8357.html** **http://stattrek.com/tutorials/ap-statistics-tutorial.aspx** **http://www.state.nj.us/education/cccs/2016/math/standards.pdf** **http://www.state.nj.us/education/cccs/2014/tech/** **https://www.cengagebrain.com/shop** **https://login.cengage.com/cb/**	
Suggested Time Frame:	44 Days

Unit 2

Content Area:	**AP Statistics**	**Grade(s)**	**10, 11 & 12**
Unit Plan Title:	**Unit 2 – 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.* **I.** Overview of methods of data collection (3 days) 1. Census 2. Sample survey 3. Experiment 4. Observational study **II.** Planning and conducting surveys (5 days) 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, stratifed random sampling and cluster sampling		

III. Planning and conducting experiments (5 days)

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

IV. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments and surveys (2 days)

NJSLS Standard(s) Addressed in this unit

S-IC A. 1. Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

S-IC B. 3. Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

S-IC B 5. Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

Essential Questions (3-5)

1. How can bad sampling leads to bias?
2. How can one distinguish between the simple random sample, stratified random sample, and cluster sample?
3. What is the difference between sample surveys, experiments, and observational studies?

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Suggested Time Frame:	15 Days

Unit 3

Content Area:	AP Statistics	Grade(s)	10, 11 & 12
Unit Plan Title:	**Unit 3 – Anticipating Patterns:** Exploring random phenomena using probability and simulation (20%–30%) *Probability is the tool used for anticipating what the distribution of data should look like under a given model.* **I.** Probability (20 days) 1. Interpreting probability, including long-run relative frequency interpretation 2. "Law of Large Numbers" concept		

3. Addition rule, multiplication rule, conditional probability and independence

4. Discrete random variables and their probability distributions, including binomial and geometric

5. Simulation of random behavior and probability distributions

6. Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable

II. Combining independent random variables (4 days)

1. Notion of independence versus dependence

2. Mean and standard deviation for sums and differences of independent random variables

III. The normal distribution (2 days)

1. Properties of the normal distribution

2. Using tables of the normal distribution

3. The normal distribution as a model for measurements

IV. Sampling distributions (14 days)

1. Sampling distribution of a sample proportion

2. Sampling distribution of a sample mean

3. Central Limit Theorem

4. Sampling distribution of a difference between two independent sample proportions

5. Sampling distribution of a difference between two independent sample means

	6. Simulation of sampling distributions 7. t-distribution 8. Chi-square distribution

NJSLS Standard(s) Addressed in this unit

S-IC A. 2. Decide if a specified model is consistent with results from a given data-generating process, e.g., using simulation. *For example, a model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?*

S-CP A. 1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").

S-CP A. 2. Understand that two events *A* and *B* are independent if the probability of *A* and *B* occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

S-CP A. 3. Understand the conditional probability of *A* given *B* as *P*(*A* and *B*)/*P*(*B*), and interpret independence of *A* and *B* as saying that the conditional probability of *A* given *B* is the same as the probability of *A*, and the conditional probability of *B* given *A* is the same as the probability of *B*.

S-CP A. 4. Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities. *For example, collect data from a random sample of students in your school on their favorite subject among math, science, and English. Estimate the probability that a randomly selected student from your school will favor science given that the student is in tenth grade. Do the same for other subjects and compare the results.*

S-CP A. 5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. *For example, compare the chance of having lung cancer if you are a smoker with the chance of being a smoker if you have lung cancer.*

S-CP B. 6. Find the conditional probability of *A* given *B* as the fraction of *B*'s outcomes that also belong to *A*, and interpret the answer in terms of the model.

S-CP B. 7. Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in terms of the model.

S-CP B. 8. (+) Apply the general Multiplication Rule in a uniform probability model, P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in terms of the model.

S-CP B. 9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

S-MD A. 1. (+) Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.

S-MD A. 2. (+) Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.

S-MD A. 3. (+) Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. *For example, find the theoretical probability distribution for the number of correct answers obtained by guessing on all five questions of a multiple-choice test where each question has four choices, and find the expected grade under various grading schemes.*

S-MD A. 4. (+) Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value. *For example, find a current data distribution on the number of TV sets per household in the United States, and calculate the expected number of sets per household. How many TV sets would you expect to find in 100 randomly selected households?*

S-*MD B. 5. (+) Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.*

S-*MD B. 5. a.* Find the expected payoff for a game of chance. For example, find the expected winnings from a state lottery ticket or a game at a fast food restaurant.

S-*MD B. 5. b. Evaluate and compare strategies on the basis of expected values. For example, compare a high-deductible versus a low-deductible automobile insurance policy using various, but reasonable, chances of having a minor or a major accident.*

S-MD B. 6. (+) Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

S-MD B. 7. (+) Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Essential Questions (3-5)

1. What influences the probability that a given event will occur?
2. What is the difference between experimental and theoretical probability?
3. What determines whether an event is dependent or independent?

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Excel
SAS/STAT, JMP, Minitab, ASCII Software
MyStatLab
Canvas
https://www.khanacademy.org/math/statistics-probability
https://www.desmos.com/calculator
http://apcentral.collegeboard.com/apc/members/exam/exam_information/8357.html
http://stattrek.com/tutorials/ap-statistics-tutorial.aspx
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Suggested Time Frame:	40 Days

Unit 4

Content Area:	**AP Statistics**	**Grade(s)**	**10, 11 & 12**

Unit Plan Title:	**Unit 4 – Statistical Inference:** Estimating population parameters and testing hypotheses (30%–40%) *Statistical inference guides the selection of appropriate models.* **I.** Estimation (point estimators and con dence intervals) (16 days) 1. Estimating population parameters and margins of error 2. Properties of point estimators, including unbiasedness and variability 3. Logic of condence intervals, meaning of con dence level and condence intervals, and properties of con dence intervals 4. Large sample condence interval for a proportion 5. Large sample condence interval for a difference between two proportions 6. Condence interval for a mean 7. Condence interval for a difference between two means (unpaired and paired) 8. Condence interval for the slope of a least-squares regression line **II.** Tests of signicance (16 days) 1. Logic of signi cance 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 3. Large sample test for a difference between two proportions 4. Test for a mean 5. Test for a difference between two means (unpaired and paired) 6. Chi-square test for goodness of t, homogeneity of proportions, and independence (one- and two-way tables) 7. Test for the slope of a least-squares regression line
NJSLS Standard(s) Addressed in this unit	
S-IC B. 4. Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of	

simulation models for random sampling.

S-IC B. 6. Evaluate reports based on data.

S-ID A. 4. Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve.

S-ID C. 7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.

Essential Questions (3-5)

1. How are Type I and Type II errors defined?
2. How are hypothesis tested?
3. How important is confidence interval in estimation?

Anchor Text

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http://www.state.nj.us/education/cccs/2016/math/standards.pdf
http://www.state.nj.us/education/cccs/2014/tech/
https://www.cengagebrain.com/shop
https://login.cengage.com/cb/

Suggested Time Frame:	32 Days

Unit 5

Content Area:	**AP Statistics**	**Grade(s)**	**10, 11 & 12**
Unit Plan Title:	**Unit 5 – Practice for AP Test -** Students will be able to independently apply their learning to effectively complete the AP Statistic Exam. **Computer Modeling for Exploring Data, Sampling and Experimentation, Anticipating Patterns and Statistical Inference –** Students will be able to apply all previously learned material by using excel and statistical software to analyze data.		

NJSLS Standard(s) Addressed in this unit

New Jersey Core Curriculum Content Standards - Mathematics

Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data.

The **basic modeling cycle** is summarized in the diagram. It involves **(1) identifying variables in the situation and selecting those that represent essential features, (2) formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables, (3) analyzing and performing operations on these relationships to draw conclusions, (4) interpreting the results of the mathematics in terms of the original situation, (5) validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable, (6) reporting on**

the conclusions and the reasoning behind them. Choices, assumptions, and approximations are present throughout this cycle.

In descriptive modeling, a model simply describes the phenomena or summarizes them in a compact form. Graphs of observations are a familiar descriptive model – for example, graphs of global temperature and atmospheric CO_2 over time.

Analytic modeling seeks to explain data on the basis of deeper theoretical ideas, albeit with parameters that are empirically based;

Graphing utilities, spreadsheets, computer algebra systems, and dynamic geometry software are powerful tools that can be used to model purely mathematical phenomena (e.g., the behavior of polynomials) as well as physical phenomena.

New Jersey Core Curriculum Content Standards – Technology

8.1.2.A.5 Enter information into a spreadsheet and sort the information.
8.1.5.A.4 Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.
8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.
8.1.12.F.1 Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

Essential Questions (3-5)

1. What types of technology is used for statistical analysis?
2. How do we use a model to make statistical inference?
3. How do we use excel or stat softwares to construct graphical displays.

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Statistical Analysis with Excel For Dummies 4th Edition by Joseph Schmuller **ISBN-13:** 978-1119271154

Excel Technology Manual to Accompanny Introduction to Statistics & Data Analysis, 5th Edition by Melissa M. Sovak

ISBN-13: 978-1-305-26891-3

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http://www.state.nj.us/education/cccs/2014/tech/
https://www.cengagebrain.com/shop
https://login.cengage.com/cb/

Suggested Time Frame:	24 Days Study Time for AP Test 19 days of Modeling using the computer

III. AP Statistics Exam

The AP Statistics Exam is 3 hours long and seeks to determine how well a student has mastered the concepts and techniques of the subject matter of the course. This paper-and-pencil exam consists of (1) a 90-minute multiple-choice section testing proficiency in a wide variety of topics, and (2) a 90-minute free-response section requiring the student to answer open-ended questions and to complete an investigative task involving more extended reasoning. In the determination of the score for the exam, the two sections will be given equal weight.

Format of Assessment

Section I: Multiple Choice | 40 Questions | 1 Hour, 30 Minutes | 50% of Exam Score

• Individual Questions

Section II: Free Response | 6 Questions | 1 Hour, 30 Minutes | 50% of Exam Score

• 5 Short-Answer Questions 1

• Investigative Task

Formulas and Tables

Students enrolled in the AP Statistics course should concentrate their time and effort on developing a thorough understanding of the fundamental concepts of statistics. They do not need to memorize formulas. The formulas and tables will be furnished to students taking the AP Statistics Exam. Teachers are encouraged to familiarize their students with the formulas and notation of these formulas by making them accessible at the appropriate times during the course.

Use of Graphing Calculators and Computers

The graphing calculator and computer are essential tools for structured inquiry in AP Statistics. The graphing calculator is the only aid students are allow to use during the AP test. A computer cannot be use but compter output will be provided during the AP test. Students will use their graphing calculator extensively throughout the course. Most assignments, numerous in class activities and test will require the use of a graphing calculator. Students will also use a computer and utilize statistics software, MS Excel as well as some Internet applets. During unit 1 to 4, students will utilize the use of a graphing calculator then in unit 5 they will use the computer for data analysis.

IV. Instructional Strategies

- Lecture
- Graphs and other visuals
- Student investigative activities
- Engaging in discussions
- Reading silently and aloud
- Brainstorming
- Listening
- Participating in small and large groups
- Collaborative projects
- Answering questions (oral and written)
- Summarizing
- Debating
- Analyzing data, discussions, etc.
- Peer teaching
- Playing games
- Note taking
- Writting

Differentiated Instruction

- Students will work individually, engage in cooperative learning, and utilize discovery learning on certain activities. Through the use of lectures, the internet, and interactive whiteboards, students will be exposed to various teaching methods to appeal to visual, auditory, and kinesthetic learners. Students will be given copies of data sets and other important notes.

V. Methods of Student Evaluation

Assessment can be divided into two general categories: formal (graded) and informal/classroom-based (both graded and ungraded). The key to effectively assessing a student's mastery of skills is to match the assessment method to the learning objective.

Formal Assessments

- Homework and classwork assignments
- Reports and presentations
- Technological applications
- Multiple choice assessment
- Quizzes
- Projects
- Short answer and problem solving assessment
- Tests
- Investigative task

Informal Assessments

- Instructor's observations of note-taking, and organization of notebooks and assignments
- Class Participation
- Cooperative learning activities
- Observing citizenship and appropriate social responses
- Instructor's observations of time management skills

VI. Scope and Sequence

Key: I – Introduced, D-developed in Depth, R-Reinforced

Skill/Concepts to be Learned	**10**	**11**	**12**
In examining distributions of data, students should be able to detect important characteristics, such as shape, location, variability and unusual values.	IDR	IDR	IDR
From careful observations of patterns in data, students can generate conjectures about relationships among variables.	IDR	IDR	IDR
The notion of how one variable may be associated with another permeates almost all of statistics, from simple comparisons of proportions through linear regression.	IDR	IDR	IDR
The difference between association and causation must accompany this conceptual development throughout.	IDR	IDR	IDR
If data are to be collected to provide an answer to a question of interest, a careful plan must be developed.	IDR	IDR	IDR
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.	IDR	IDR	IDR
Collecting data in a reasonable way, through either sampling or experimentation, is an essential step in the data analysis process.	IDR	IDR	IDR
Random phenomena are not haphazard: they display an order that emerges only in the long run and is described by a distribution.	IDR	IDR	IDR
The mathematical description of variation is central to statistics.	IDR	IDR	IDR
The probability required for statistical inference is not primarily axiomatic or combinatorial but is oriented toward using probability distributions to describe data.	IDR	IDR	IDR

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.	IDR	IDR	IDR
Inference from data can be thought of as the process of selecting a reasonable model, including a statement in probability language, of how con dent one can be about the selection.	IDR	IDR	IDR
Use technology to: Describe patterns and departures from patterns; Plan and conduct a study; Explore random phenomena using probability and simulation; and Estimate population parameters and test hypotheses.	IDR	IDR	IDR

VII. Textbooks, Instructional Resources and Software

Introduction to Statistics and Data Analysis Authors : Roxy Peck; Chris Olsen; Jay L. Devore, 5th Edition, AP Edition

Resources for Students	Resources for Teachers
Digital CourseMate, Aplia, JMP statistical software Cengagebrain.com • Step by Step intsructions for JMP, TI-84 Graphing Calculators, Excel, Minitab, and SPSS • Data sets formatted for JMP, TI-84, Excel, Minitab, SPSS, SAS, and ASCII • Video Solutions • Applets used in the Activities **Print** Student Solutions Manual ISBN: 978-1-3052-6582-0 Fast Track to a 5 ISBN: 978-1-3052-6604-9	**Digital** CourseMate, Aplia, JMP statistical software Companion website: cengage.com/login • PowerPoint presentations ISBN: 978-1-3052-6608-7 • Images • ExamViiew • Complete Solutions Manual • Cengage Learning Testing by Cognero ISBN: 978-1-3052-65289-9 **Print** Annotatted Instructor's Edition ISBN: 978-1-3052-5252-3 Teacher's Resource Binder ISBN: 978-1-3052-6605-6

VIII. AP Statistics Curriculum Correlation Chart with Textbook

AP® Statistics Topic	Corresponding Text Sections
I. Exploring data: Describing patterns and departures from patterns	
IA. Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)	
IA1. Center and spread	1.4, 3.2, 3.3
IA2. Clusters and gaps	1.4, 3.2, 3.3
IA3. Outliers and other unusual features	1.4, 3.2, 3.3
IA4. Shape	3.2, 3.3
IB. Summarizing distributions of univariate data	
IB1. Measuring center: median, mean	4.1
IB2. Measuring spread: range, interquartile range, standard deviation	4.2
IB3. Measuring position: quartiles, percentiles, standardized scores (-scores)	4.2, 4.3, 4.4
IB4. Using boxplots	4.3, 4.5
IB5. The effect of changing units on summary measures	4.1, 4.2
1C. Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)	
IC1. Comparing center and spread: within group, between group variation	1.4, 3.2, 3.3
IC2. Comparing clusters and gaps	1.4, 3.2, 3.3, 3.4
IC3. Comparing outliers and other unusual features	1.4, 3.2, 3.3, 4.3
IC4. Comparing shapes	3.2, 3.3
1D. Exploring bivariate data	
ID1. Analyzing patterns in scatterplots	3.1, 3.4
ID2. Correlation and linearity	5.1
ID3. Least-squares regression line	5.2, 5.3, 5.4, 5.5
ID4. Residual plots, outliers, and influential points	5.3
ID5. Transformations to achieve linearity: logarithmic and power transformations	5.4
IE. Exploring categorical data	
IE1. Frequency tables and bar charts	1.2, 1.4, 3.1, 3.5, 6.2, 6.3
IE2. Marginal and joint frequencies for two-way tables	6.4
IE3. Conditional relative frequencies and associations	6.4

IE4. Comparing distributions using bar charts	3.1
II. Sampling and experimentation: Planning and conducting a study	
IIA. Overview of methods of data collection	
IIA1. Census	2.2
IIA2. Sample survey	2.1, 2.2, 2.5
IIA3. Experiment	2.1, 2.3, 2.4, 2.5
IIA4. Observational study	2.1
IIB. Planning and conducting surveys	
IIB1. Characteristics of a well-designed and well-conducted survey	2.2, 2.5
IIB2. Populations, samples, and random selection	2.1, 2.2, 2.5
IIB3. Sources of bias in sampling and surveys	2.2, 2.5
IIB4. Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling	2.2
IIC. Planning and conducting experiments	
IIC1. Characteristics of a well-designed and well-conducted experiment	2.1, 2.3, 2.4, 2.5
IIC2. Treatments, control groups, experimental units, random assignments, and replication	2.3, 2.4, 2.5
IIC3. Sources of bias and confounding, including placebo effect and blinding	2.3, 2.4, 2.5
IIC4. Completely randomized design	2.3, 2.4
IIC5. Randomized block design	2.3, 2.4
	2.1, 2.5
IID. Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys	
III. Anticipating patterns: Exploring random phenomena using probability and simulation	
IIIA. Probability	
IIIA1. Interpreting probability, including long-run relative frequency interpretation	6.1, 6.2, 6.3
IIIA2. “Law of Large Numbers” concept	6.2, 6.3
IIIA3. Addition rule, multiplication rule, conditional probability, and independence	6.3, 6.4, 6.5, 6.6
IIIA4. Discrete random variables and their probability distributions, including binomial and geometric	7.1, 7.2, 7.5
IIIA5. Simulation of random behavior and probability distributions	6.7
IIIA6. Mean (expected value) and standard deviation of a random variable, and linear	7.4

transformation of a random variable	
IIIB. Combining independent random variables	
IIIB1. Notion of independence versus dependence	6.5
IIIB2. Mean and standard deviation for sums and differences of independent random variables	7.4
IIIC. The normal distribution	
IIIC1. Properties of the normal distribution	7.6
IIIC2. Using tables of the normal distribution	7.6
IIIC3. The normal distribution as a model for measurements	7.6
IIID. Sampling distributions	
IIID1. Sampling distribution of a sample proportion	8.3
IIID2. Sampling distribution of a sample mean	8.2
IIID3. Central Limit Theorem	8.2
IIID4. Sampling distribution of a difference between two independent sample proportions	11.3
IIID5. Sampling distribution of a difference between two independent sample means	11.1
IIID6. Simulation of sampling distributions	8.3
IIID7. -distribution	9.3
IIID8. Chi-square distribution	12.1
IV. Statistical inference: Estimating population parameters and testing hypotheses	
IVA. Estimation (point estimators and confidence intervals)	
IVA1. Estimating population parameters and margins of error	9.1, 9.4
IVA2. Properties of point estimators, including unbiasedness and variability	9.1
IVA3. Logic of confidence intervals, the meaning of confidence level and confidence intervals, and properties of confidence intervals	9.2
IVA4. Large sample confidence interval for a proportion	9.2
IVA5. Large sample confidence interval for a difference between two proportions	11.3
IVA6. Confidence interval for a mean	9.3
IVA7. Confidence interval for a difference between two means (unpaired and paired)	11.1, 11.2
IVA8. Confidence interval for the slope of a least-squares regression line	13.1, 13.2
IVB. Tests of significance	
IVB1. Logic of significance testing, null and alternative hypotheses; -values; one and two-sided tests; concepts of Type I and Type II errors; concept of power	10.1, 10.2, 10.3, 10.5

IVB2. Large sample test for a proportion	10.3
IVB3. Large sample test for a difference between two proportions	11.3
IVB4. Test for a mean	10.4
IVB5. Test for a difference between two means (unpaired and paired)	11.1, 11.2
IVB6. Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)	12.1, 12.2, 12.3
IVB7. Test for the slope of a least-squares regression line	13.1, 13.2

IX. Student Handout

AP Statistics Course Overview

The AP Statistics course is equivalent to a one-semester, introductory, non-calculus-based college course in statistics.The course introduces students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data.There are four themes in the AP Statistics course: exploring data, sampling and experimentation, anticipating patterns, and statistical inference. Students use technology, investigations, problem solving, and writing as they build conceptual understanding. Students must have taken second-year algebra before enrolling in AP Statistics. The AP Statistics Exam is 3 hours long and seeks to determine how well a student has mastered the concepts and techniques of the subject matter of the course. This paper-and-pencil exam consists of (1) a 90-minute multiple-choice section testing proficiency in a wide variety of topics, and (2) a 90-minute free-response section requiring the student to answer open-ended questions and to complete an investigative task involving more extended reasoning. In the determination of the score for the exam, the two sections will be given equal weight.

Poficiency

I. Exploring Data

- Constructing and interpreting graphical displays of distributions of univariate data
- Summarizing and comparing distributions of univariate data
- Exploring bivariate and categorical data

II. Sampling and Experimentation

- Planning and conducting surveys and experiments using appropriate methods of data collection
- Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys

III. Anticipating Patterns

- Exploring random phenomena using probability and simulation
- Combining independent random variables
- The normal distribution
- Sampling distributions

IV. Statistical Inference

- Estimating population parameters and testing hypotheses
- Tests of significance