

Advanced Placement Statistics 2020-2021

Course Syllabus

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Woodland High

Objective:

AP Statistics is a rigorous, college level, non-calculus based course intended to be the equivalent of a first year college level course. The course is guided by the AP syllabus and covers the following areas: organizing data, normal, binomial, geometric, and sample distributions, correlation, experimental designs, probability, and statistical inference and testing. Upon completion students will develop into competent interpreters and users of statistical data and information. Decision-making and justification of statistical hypotheses are emphasized. The AP Statistics course will prepare students for the College Board Advanced Placement Exam which is given in May. Students can earn college credit for this course by scoring from 3 to 5 on the exam. The amount of credit granted varies among colleges and universities.

Course Comments:

Since the potential exists to earn college credit, it is expected that you take the course seriously. Students must be active participants since the "best" learning occurs when students are actively involved in the learning process. To this end AP Statistics will be a "hands-on", practical applications oriented class. Computers and calculators are used extensively to allow students to investigate and explore statistical concepts. Effective communication skills will be developed through regular written analysis of real data.

Textbook:

Starnes, D. S., Tabor, J., Yates, D. S., & Moore, D. S. (2006). *The practice of statistics:*

TI-83/84/89 graphing calculator enhanced (5th ed.). New York: W. H. Freeman.

Online Support of Text: Online Quizzes, Simulation Applets, Data Sets

<http://www.whfreeman.com/tps5e/> (You MUST register using your email address to use the online quizzes and certain site features.)

Supplemental Resources for Instruction:

- Against all Odds: Inside Statistics - Video Series.
- Agresti, A., & Franklin, C. (2009). *Statistics: The art and science of learning from data (2nd Ed.)*. Upper Saddle River, New Jersey: Pearson Education, Inc.
- Chatterjee, Samprit, Marks S. Handcock, and Jeffery S. Simonoff (1995). *A Casebook for a First Course in Statistics and Data Analysis*. New York: Wiley.
- Data Desk, Minitab, and/or Fathom will be used in the course for demonstration and exploration purposes.
- De Veaux, R. D., Velleman, P. F., Bock, D. E. (2005). *Stats: Data and models*. U.S.A.: Pearson-Addison Wesley.
- Erickson, T. (2001). *Data in depth: Exploring mathematics with fathom*. Emeryville, California: Key Curriculum Press.
- Freund, J. E., Walpole, R. E. (1987). *Mathematical Statistics (2nd Ed.)*. Englewood Cliffs, New Jersey: Prentice-Hall, Inc.
- Graphing calculator, TI-83/83 Plus/84/84 Plus/nSpire and TI-89.
- Hinders, Duane C. (2004). *5 steps to a 5: AP statistics*. New York: McGraw-Hill.
- Mulekar, M. (2003). *Cracking the AP Statistics Exam*. New Jersey: Princeton Review.
- Rossman, Allan J., Beth L. Chance, and Robin H. Lock. J. (2001). *Workshop Statistics: Discovery with Data and Fathom*. Emeryville, Ca.: Key College Publishing.
- Scheaffer, R. L., Gnanadesikan, M., Watkins, A., and Witmer, J. A. (1996). *Activity-based statistics*. Rensselaer, NY: Hamilton Printing Co.
- Sternstein, M. (2004). *Barron's how to prepare for the AP statistics: Advanced placement test in statistics*. Hauppauge, New York: Barron's Educational Series, Inc.

A note about calculators:

Graphing calculators are allowed on the AP Statistics exam and will be used extensively in this class. In fact, the Texas Instruments TI-83+ was specifically designed to facilitate statistical and financial data analysis and is the tool the AP exam authors considered while designing questions. It is imperative that all students have access to a calculator such as the TI-83/83+, TI-84/84+, TI-*nspire*, TI-*nspire* CX, Casio Classpad 300, FX-9750GPlus, or 9860G. The class will be taught using the TI-*nspire* calculator as well as software that goes with the TI-*nspire*. If you show up to the AP Statistics test without an approved calculator please be aware that your chances of passing are extremely low. Because of the memory retaining qualities and programmability of these calculators, students will not be allowed to share calculators. It is suggested that you obtain your own calculator, however school owned calculators may be issued to students unable to secure their own.

Course Projects:

Course projects are in the form of extended formal writing assignments. Form and technical adequacy are enforced on multiple assignments throughout the year. Students will gain experience in developing statistical studies and forming a valid, justifiable conclusion including justifications.

Cumulative Project:

There will be a cumulative project for this course. It will cover the four conceptual themes of statistics: exploratory analysis, planning a study, probability, and statistical inference. Task: Develop a question, research the question and use statistical analysis to determine an answer. Specifically, decide on a question to investigate – be ingenious. Design an experiment to run, then go through the steps OR design a study, recruit subjects, place subjects into groups (randomly, of course), impose the treatments, etc. OR perform a simulation on the calculator. Collect data, plot the data, and finally perform inference. Demonstrate the use of the 4 inference steps. Then analyze the data and draw a conclusion. Write up a report and orally report your study findings to the class.

Course Outline:

AP Statistics is an activity-based course where students actively construct their own understanding of statistical concepts and techniques. Broad topics include Exploring and Describing Data, Planning and Design of a Study to produce Data using Samples, Experiments, and Simulations, Probability and patterns in distributions, and Statistical Inference with confidence. The teacher will facilitate and guide students' explorations and formations of hypotheses. Instruction on the use of technology's statistical data analysis tools will include the graphing calculator, and statistical software, including Fathom, Active Stats, and Data Desk. First semester will cover Chapters 1 - 9. Second semester will cover Chapters 10-14 prior to spring break with preparation for the AP Exam during April and early May. The second semester major project will be completed following the AP Exam including written and oral presentations of student selected area(s) of interest.

These are the course skills addressed by the course and AP Exam:



AP STATISTICS
Course Skills

Skill Category 1	Skill Category 2	Skill Category 3	Skill Category 4
Selecting Statistical Methods 1 Select methods for collecting and/or analyzing data for statistical inference.	Data Analysis 2 Describe patterns, trends, associations, and relationships in data.	Using Probability and Simulation 3 Explore random phenomena.	Statistical Argumentation 4 Develop an explanation or justify a conclusion using evidence from data, definitions, or statistical inference.

SKILLS

1.A Identify the question to be answered or problem to be solved (<i>not assessed</i>).	2.A Describe data presented numerically or graphically.	3.A Determine relative frequencies, proportions, or probabilities using simulation or calculations.	4.A Make an appropriate claim or draw an appropriate conclusion.
1.B Identify key and relevant information to answer a question or solve a problem.	2.B Construct numerical or graphical representations of distributions.	3.B Determine parameters for probability distributions.	4.B Interpret statistical calculations and findings to assign meaning or assess a claim.
1.C Describe an appropriate method for gathering and representing data.	2.C Calculate summary statistics, relative positions of points within a distribution, correlation, and predicted response.	3.C Describe probability distributions.	
	2.D Compare distributions or relative positions of points within a distribution.		

INFERENCE

1.D Identify an appropriate inference method for confidence intervals.	3.D Construct a confidence interval, provided conditions for inference are met.	4.C Verify that inference procedures apply in a given situation.
1.E Identify an appropriate inference method for significance tests.	3.E Calculate a test statistic and find a p -value, provided conditions for inference are met.	4.D Justify a claim based on a confidence interval.
1.F Identify null and alternative hypotheses.		4.E Justify a claim using a decision based on significance tests.

Exam Weighting for the Multiple-Choice Section of the AP Exam

Units	Exam Weighting
Unit 1: Exploring One-Variable Data	15–23%
Unit 2: Exploring Two-Variable Data	5–7%
Unit 3: Collecting Data	12–15%
Unit 4: Probability, Random Variables, and Probability Distributions	10–20%
Unit 5: Sampling Distributions	7–12%
Unit 6: Inference for Categorical Data: Proportions	12–15%
Unit 7: Inference for Quantitative Data: Means	10–18%
Unit 8: Inference for Categorical Data: Chi-Square	2–5%
Unit 9: Inference for Quantitative Data: Slopes	2–5%

First semester will cover Units 1 through 5. Second semester will cover Units 6 through 9.

Course at a Glance

Plan

The Course at a Glance provides a useful visual organization of the AP Statistics curricular components, including:

- Sequence of units, along with approximate weighting and suggested pacing.
- Please note, pacing is based on 45-minute class periods, meeting five days each week for a full academic year.
- Progression of topics within each unit
- Spiraling of the big ideas and course skills across units

Teach

SKILL CATEGORIES

SKC categories spiral throughout the course.

- 1** Selecting Statistical Methods
- 2** Using Probability and Simulation
- 3** Data Analysis
- 4** Statistical Argumentation

+ Indicates 2+ new skills for a given topic. See the individual topic for all the relevant skills.

BIG IDEAS

Big ideas spiral across topics and units.

- VAR** Variation and Distribution
- UNC** Data-Based Inferences, Decisions, and Conclusions
- UNC** Patterns and Uncertainty

Assess

Assign the Personal Progress Checks—either as homework or in class—for each unit. Each Personal Progress Check contains formative multiple-choice and free-response questions. The feedback from the Personal Progress Checks shows students the areas where they need to focus.

UNIT 1 Exploring One-Variable Data ~14-16% Course Pacing 15-23% AP Exam Weighting	UNIT 2 Exploring Two-Variable Data ~10-11% Course Pacing 5-7% AP Exam Weighting	UNIT 3 Collecting Data ~9-10% Course Pacing 12-15% AP Exam Weighting	UNIT 4 Probability, Random Variables, and Probability Distributions ~18-20% Course Pacing 10-20% AP Exam Weighting
<p>VAR 1.1 Introducing Statistics: What Can We Learn from Data?</p> <p>UNC 1.2 The Language of Variation: Variables</p> <p>UNC 1.3 Representing a Categorical Variable with Tables</p> <p>UNC 1.4 Representing a Categorical Variable with Graphs</p> <p>UNC 1.5 Representing a Quantitative Variable with Graphs</p> <p>UNC 1.6 Describing the Distribution of a Quantitative Variable</p> <p>UNC 1.7 Summary Statistics for a Quantitative Variable</p> <p>UNC 1.8 Graphical Representations of Summary Statistics</p> <p>UNC 1.9 Comparing Distributions of a Quantitative Variable</p> <p>VAR 1.10 The Normal Distribution</p>	<p>VAR 2.1 Introducing Statistics: Are Variables Related?</p> <p>UNC 2.2 Representing Two Categorical Variables</p> <p>UNC 2.3 Statistics for Two Categorical Variables</p> <p>UNC 2.4 Representing the Relationship Between Two Quantitative Variables</p> <p>UNC 2.5 Correlation</p> <p>UNC 2.6 Linear Regression Models</p> <p>UNC 2.7 Residuals</p> <p>UNC 2.8 Least Squares Regression</p> <p>UNC 2.9 Analyzing Departures from Linearity</p>	<p>VAR 3.1 Introducing Statistics: Do the Data We Collected Tell the Truth?</p> <p>UNC 3.2 Introduction to Planning a Study</p> <p>UNC 3.3 Random Sampling and Data Collection</p> <p>UNC 3.4 Potential Problems with Sampling</p> <p>UNC 3.5 Introduction to Experimental Design</p> <p>UNC 3.6 Selecting an Experimental Design</p> <p>UNC 3.7 Inference and Experiments</p>	<p>VAR 4.1 Introducing Statistics: Random and Non-Random Patterns?</p> <p>UNC 4.2 Estimating Probabilities Using Simulation</p> <p>VAR 4.3 Introduction to Probability</p> <p>VAR 4.4 Mutually Exclusive Events</p> <p>VAR 4.5 Conditional Probability</p> <p>VAR 4.6 Independent Events and Unions of Events</p> <p>VAR 4.7 Introduction to Random Variables and Probability Distributions</p> <p>VAR 4.8 Mean and Standard Deviation of Random Variables</p> <p>VAR 4.9 Combining Random Variables</p> <p>UNC 4.10 Introduction to the Binomial Distribution</p> <p>UNC 4.11 Parameters for a Binomial Distribution</p> <p>UNC 4.12 The Geometric Distribution</p>
<p>Personal Progress Check 1 Multiple-choice: ~35 questions Free-response: 2 questions</p> <ul style="list-style-type: none"> • Exploring Data • Exploring Data 	<p>Personal Progress Check 2 Multiple-choice: ~35 questions Free-response: 2 questions</p> <ul style="list-style-type: none"> • Exploring Data • Investigative Task 	<p>Personal Progress Check 3 Multiple-choice: ~20 questions Free-response: 2 questions</p> <ul style="list-style-type: none"> • Exploring Data and Collecting Data • Collecting Data 	<p>Personal Progress Check 4 Multiple-choice: ~45 questions Free-response: 2 questions</p> <ul style="list-style-type: none"> • Probability • Investigative Task

UNIT 5 Sampling Distributions ~10–12 Class Periods 7–12% AP Exam Weighting	UNIT 6 Inference for Categorical Data: Proportions ~16–18 Class Periods 12–15% AP Exam Weighting	UNIT 7 Inference for Quantitative Data: Means ~14–16 Class Periods 10–18% AP Exam Weighting	UNIT 8 Inference for Categorical Data: Chi-Square ~10–11 Class Periods 2–5% AP Exam Weighting	UNIT 9 Inference for Quantitative Data: Slopes ~7–8 Class Periods 2–5% AP Exam Weighting																																																																																																																														
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Personal Progress Check 5 Multiple-choice: ~25 questions Free-response: 2 questions • Probability and Sampling Distributions • Investigative Task	Personal Progress Check 6 Multiple-choice: ~55 questions Free-response: 2 questions • Inference • Investigative Task	Personal Progress Check 7 Multiple-choice: ~80 questions Free-response: 2 questions • Inference and Collecting Data • Investigative Task	Personal Progress Check 8 Multiple-choice: ~30 questions Free-response: 2 questions • Inference • Inference and Exploring Data/Collecting Data	Personal Progress Check 9 Multiple-choice: ~25 questions Free-response: 1 question • Inference and Exploring Data																																																																																																																														

Some links to visit for enhanced learning...

Online glossary of statistical terms:

http://www.stats.gla.ac.uk/steps/glossary/hypothesis_testing.html

Online texts that may be a good resource:

HyperStat: <http://davidmlane.com/hyperstat/>

<http://www.psychstat.missouristate.edu/introbook/sbk00.htm>

Careers in Statistics:

<http://www.amstat.org/careers/index.cfm?fuseaction=presentation>

<http://www.amstat.org/careers/index.cfm?fuseaction=main>

Which schools give college credit for AP studies??

<http://www.collegeboard.com/ap/creditpolicy>

AP Central: <http://apcentral.collegeboard.com/>

Data Resources:

The New York Times: <http://www.nytimes.com/>

Bureau of Labor Statistics: <http://www.bls.gov/>

The gateway to statistics from over 100 U.S. Federal agencies: <http://www.fedstats.gov/>

Rasmussen: <http://www.rasmussenreports.com>

Zogby: <http://www.zogby.com>

The National Center for Health Statistics: <http://cdc.gov/nchs>

The National Center for Education Statistics: <http://nces.ed.gov/>

Real Clear Politics: <http://www.realclearpolitics.com>

Clinical Trials: <http://clinicaltrials.gov/>

Applets:

http://www.ruf.rice.edu/~lane/stat_sim/index.html

Statistics Links:

<http://math.about.com/od/statistics/>

GapMinder: <http://www.gapminder.com>

Khan Academy: <https://www.khanacademy.org/math/ap-statistics>

Stats Monkey: <http://apstatsmonkey.com/StatsMonkey/Statsmonkey.html>