

**AP [ADVANCED PLACEMENT] STATISTICS
GRADES 11-12**

EWING PUBLIC SCHOOLS
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In accordance with The Ewing Public Schools' Policy 2230, Course Guides, this curriculum has been reviewed and found to be in compliance with all policies and all affirmative action criteria.

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Course Description

The purpose of the Advanced Placement (AP) course in statistics is to introduce students to the major components and tools that will allow them to develop a mathematical proficiency within a purposefully designed framework that meets both the needs of the students and the expectations of the community. Students will be exposed to four broad conceptual themes:

Exploring Data
Sampling and Experimentation
Anticipating Patterns
Statistical Inference

This course engages students in a variety of learning practices that all students should strive to develop as they work toward mastering content. This includes the National Council of Teachers of Mathematics process standards for problem solving, reasoning and proof, communication, representation and connections. It also addresses the National Research Council's report (*Adding It Up - Helping Children to Learn Mathematics*) that addresses the mathematical competencies of conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition. Content standards from this course are aligned to the Common Core Standards.

The AP Statistics course is designed to be the equivalent of a one-semester, introductory college course in statistics. Students will meet on a block semester schedule for 88 minutes daily. All students are expected to take the AP exam in May. College credits awarded to students are evaluated on an individual basis and may vary between institutions. Many institutions award credits to students who score a 3 or higher on the AP exam. Some institutions require a 4 or 5.

Prerequisite:

Prerequisite for this course is satisfactory completion of Algebra II coursework.

Resources:

- Text: The Practice of Statistics 5th edition (Starnes, Yates and Moore)
- Workbook: Strive for a Five: Preparing for the AP Statistics Examination (Molesky and Legacy)

Problem Solving (Integrated Throughout the Course)

Enduring Understandings:

- A problem solver understands what has been done, knows why the process was appropriate and can support it with reasons and evidence.
- There can be different strategies to solve a problem, but some are more effective than others.
- The reasonableness of a solution is determined by the context of the problem.

Essential Questions:

- How do I know where to begin when solving a problem?
- How does explaining my process help me to understand a problem's solution?
- How do I decide what strategy will work best in a given problem situation?
- What do I do when I get stuck?
- How does finding common characteristics among similar problems help me to be a more efficient problem solver?
- How do I know when a result is reasonable?
- What is the relationship between solving problems and computation?

Acquired Knowledge:

- Distinguish between given information, unknown information and assumptions that may be necessary.
- Identify strategies to solve a problem (pattern from data, table, diagram, etc.)
- Devise a plan to solve the problem.
- Apply the appropriate strategy(ies) to solve a problem.
- Justify the strategy and solution with mathematical evidence and reasoning.
- Analyze strategies to solve a problem.
- Judge the reasonableness of a solution for a problem.
- Communicate the solution and the strategies used to solve the problem in oral and written form.
- Pose problems from given situations.

Suggested Activities:

- Small group discussions about strategies and solutions
- Written explanation of strategy and solution for a problem
- Peer editing of strategies and solutions
- Revise written solutions of problems
- Guided inquiry investigations

Assessments:

- Verbal responses
- Chapter problems (homework and class work)
- Quizzes

- Chapter tests
- Mini projects (group or individual) - independent or teacher assigned
- Practice AP exams

Standards: Common Core State Standards for Mathematical Practice

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Unit 1: Exploring Data (Pacing: 25% of Course Length)

Enduring Understandings:

- Conjectures about relationships among variables can be made through careful observations of patterns in data.
- The various methods of constructing, interpreting and comparing graphical displays of distributions of univariate data.
- Shape, location, variability and unusual values are important in examining distributions of data.
- The various methods of constructing, interpreting and comparing graphical displays of bivariate data.
- Form, strength and direction of data are important in describing bivariate data.
- The various methods of constructing, interpreting and comparing graphical displays of categorical data.

Essential Questions:

- What graphical and numerical methods can be used to study univariate, bivariate and categorical data?

Acquired Knowledge:

- Read and transfer univariate data into graphical form.
- Interpret graphical displays of s=distributions of univariate data.
- Summarize distributions of univariate data.
- Compare distributors of univariate data in the form of dot plots, back-to-back stem plots and parallel boxplots.
- Explore and analyze bivariate data.
- Explore categorical data in the form of frequency tables and bar charts.

Suggested Activities:

- Utilization of Smart Board/graphing calculator
- Spreadsheets and tables
- Utilization of resource websites and Internet research on objective
- Student-directed instruction with teacher as facilitator
- Independent study options with teacher guiding individual/group options
- Peer-to-peer interactive instruction

Assessments:

- Verbal responses
- Chapter problems (homework and class work)
- Quizzes
- Chapter tests
- Mini projects (group or individual) - independent or teacher assigned
- Practice AP exams

Standards:

S-IC-1, 3
S-ID-1, 5

Unit 2: Sampling and Experimentation (Pacing: 15% of Course Length)

Enduring Understandings:

- 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.

Essential Questions:

- How can data be collected and analyzed in order to answer a question of interest?

Acquired Knowledge:

- Recognize and interpret the different methods of data collection in planning a study (census, sample survey, experiment and observational study).
- Plan and conduct surveys.
- Plan and conduct experiments.
- Assess the generalizability of results from observational studies, experimental studies and surveys.

Suggested Activities:

- Utilization of Smart Board/graphing calculator
- Spreadsheets and tables
- Utilization of resource websites and Internet research on objective
- Student-directed instruction with teacher as facilitator
- Independent study options with teacher guiding individual/group options
- Peer-to-peer interactive instruction

Assessments:

- Verbal responses
- Chapter problems (homework and class work)
- Quizzes
- Chapter tests
- Mini projects (group or individual) - independent or teacher assigned
- Practice AP exams

Standards:

-IC-1

Unit 3: Anticipating Patterns (Pacing: 30% of Course Length)

Enduring Understandings:

- Random phenomena are not haphazard.
- The mathematical description of variation is central to statistics.
- Probability distributions to describe data are required for statistical inference.

Essential Questions:

- How can data be collected and analyzed in order to answer a question of interest?

Acquired Knowledge:

- Recognize and interpret the different methods of data collection in planning a study (census, sample survey, experiment and observational study).
- Plan and conduct surveys.
- Plan and conduct experiments.
- Assess the generalizability of results from observational studies, experimental studies and surveys.

Suggested Activities:

- Utilization of Smart Board/graphing calculator
- Spreadsheets and tables
- Utilization of resource websites and Internet research on objective
- Student-directed instruction with teacher as facilitator
- Independent study options with teacher guiding individual/group options
- Peer-to-peer interactive instruction

Assessments:

- Verbal responses
- Chapter problems (homework and class work)
- Quizzes
- Chapter tests
- Mini projects (group or individual) - independent or teacher assigned
- Practice AP exams

Standards:

S-ID-4
S-CP-1-8

Unit 4: Statistical Inference (Pacing: 30% of Course Length)

Enduring Understandings:

- Probability is the underlying concept in statistical inference and allows us to assess the evidence provided by the data in favor of some claim about the population.
- There are important assumptions and conditions we must check before using any statistical inference procedure.
- Although the calculator computes numerical test results, it is necessary to also interpret the results both graphically and verbally in the context of the original question.

Essential Questions:

- How can a model be used to draw conclusion from data?
- How confident can we be that the model is appropriate?
- To what population can our results be generalized?

Acquired Knowledge:

- Calculate and interpret confidence intervals (CI) and point estimators
- Calculate and analyze a large sample CI for a:
 - Mean [the population standard deviation is known, the population standard deviation is unknown]
 - Proportion
 - Difference between two means
 - Difference between two proportions
- Estimate population parameters and margins of error
- Understand properties of point estimators including unbiasedness and variability.
- Develop reasoning skills to successfully design and analyze test for significance.
- Plan, conduct and analyze results of a large sample test of significance for a proportion and the difference between two proportions.
- Plan, conduct and analyze results of a large sample test of significance for the difference between two means and/or two proportions.
- Plan, conduct and analyze results of the Chi square test for goodness of fit, homogeneity of proportions and independence.
- Plan, conduct and analyze results of a large sample test of significance for the slope of a least squares regression line.

Suggested Activities:

- Utilization of Smart Board/graphing calculator
- Spreadsheets and tables
- Utilization of resource websites and Internet research on objective
- Student-directed instruction with teacher as facilitator
- Independent study options with teacher guiding individual/group options
- Peer-to-peer interactive instruction

Assessments:

- Verbal responses
- Chapter problems (homework and class work)
- Quizzes
- Chapter tests
- Mini projects (group or individual) - independent or teacher assigned
- Practice AP exams

Standards:

S-IC-1

S-ID-4