



S T A T I S T I C S

TEACHER'S GUIDE



Chapter II:

Excerpt: How to Begin an AP Course in Statistics

Technological Needs—Calculators and Computers

Modern technology, in the form of calculators and computers, has helped to redefine the nature of mathematics teaching and learning in the last three decades. The breathtaking speed with which calculators and computers have increased in capability, combined with a steady reduction of prices, has forced mathematics teachers to reevaluate not only what is important to teach in a mathematics curriculum, but also how mathematics *can* be taught. While economic issues will always be a factor and each district must determine its own policies, calculators and computers should be a standard resource in an AP Statistics class.

Calculators and computers each offer unique opportunities to statistics students. For instance, the small size and mobility of calculators combined with laboratory probes that can sample temperature, light, pH, and other variables bring realistic experimentation and data gathering to the classroom. On the other end of the spectrum, the modern computer can store large data sets for interactive data analysis; provide variety, speed, and visualization to simulations; and thereby offer better understanding of the phrase “in the long run” of sampling distributions, and of the Central Limit Theorem. There is no balance of the two technologies that is perfect for all teachers and students in an AP Statistics class, and the course has been successfully taught by teachers in situations with wide ranges of calculator and computer availability.

While taking the AP Statistics Exam, students are expected to have a calculator with statistical computation and statistical graphics capabilities. A calculator with a typewriter keyboard is not allowed. The computational capabilities of the calculator are adequate if they include standard statistical univariate and bivariate summaries through linear regression. The graphical capabilities are adequate if they include common univariate and bivariate displays, such as histograms, boxplots, and scatterplots. Students find calculators where data are entered into a spreadsheet format particularly easy to use.

During the exam, students are *not* permitted to have access to any information in their graphing calculators or elsewhere that is not directly related to upgrading the statistical functionality of older graphing calculators to make them comparable to statistical features found on newer models. Acceptable upgrades include improving the calculator’s computational functionalities and/or graphical functionalities for data that students key into the calculator while taking the examination. Unacceptable enhancements include, but are not limited to, keying or scanning text or response templates into the calculator. Students attempting to augment the capabilities of their graphing calculators in any way other than for the purpose of upgrading features as described above will be considered to be cheating on the examination.

Students are expected to use calculators on the exam; thus, they should have access to them throughout the course, both in class and for homework. The fact that calculators are available means that an AP Statistics Exam question will not, for example, simply ask students to compute a standard deviation but will test their understanding of what the standard deviation measures.

How to Begin an AP Course in Statistics

As calculators become more powerful and computers become smaller, the pedagogical distinction between the two will be difficult to make. Meanwhile, access to computers will enrich your course. Statistical software still has capabilities that extend far beyond those of calculators, including extensive, interactive, and flexible graphics and the ability to perform simulations easily, quickly, and with very large samples. The use of a computer for statistical computing and statistical graphics is essential in the work of most statisticians. There is no component of actual computer use on the AP Statistics Exam, but students will be required to interpret computer output from such standard statistical packages as Minitab, Data Desk, JMP, or their student versions.

Examples of computer output appear in the section “Interpreting Sample Computer Output,” beginning on page 73. Students who have had experience with only one statistical package should nevertheless be able to read and interpret generic computer output that appears on the AP Exam. Many introductory statistics textbooks give sample output from various packages that you may want to make available to your students, whether or not they use computers. Students should be advised that they are not required to understand every part of the computer output, but they must be able to pick out and interpret those components that pertain to the topics covered in the Topic Outline of the *AP Statistics Course Description*. Examples of AP Statistics Exam questions that require interpretation of computer output can be found at AP Central. The use of computers is discussed further in the section “The Use of Technology in AP Statistics,” beginning on page 25.

A wide variety of computer software packages is available at a variety of prices. The software you choose must allow for easy entry and editing of data. It must also be capable of easily producing the standard plots used in data analysis and the standard numerical summaries from basic univariate statistics through simple linear regression, and do all of this correctly. In addition, the software should produce the computations for statistical analyses related to inference (interval estimation and tests of significance) once the student selects the type of analysis to be performed.

As with textbook selection, the AP Statistics Electronic Discussion Group, an online community of high school and college statistics teachers, can help with software selection if you are unfamiliar with existing packages. In many cases, producers of statistics software offer very reasonably priced academic versions. These have less functionality than the originals, but they easily perform all data analysis tasks that arise in the AP Statistics course. Some statistics teachers have successfully used spreadsheet programs for statistical analyses. Generally, these programs are less satisfactory than programs designed specifically for statistics. If your students use a spreadsheet, be sure they have seen output from statistical software packages as well.

Not all students have computers at home, and the school should provide sufficient time for these students to use the school’s laboratory at flexible hours. Students who do have home computers should be encouraged to use them for computation, data exploration, and simulations, if at all possible.