# Overview of AP Statistics Program
# Newport News Public Schools

## Course Design

Teaching materials for the course come from textbooks, classroom lectures, newspapers, journals, videos, and the World Wide Web. At the start of the school year, students receive a list of formulas and tables from the course description book. Students also have access to a classroom set of TI-83 calculators. Students who do not own a calculator use the ones provided by the school for class work and then check them out after school for home use. Approximately twice a semester students float into the computer math lab to complete statistics computer assignments. MINITAB Statistical Software is the software package used for the computer labs.

Projects are also a major part of the course. The point of these projects are to see that students are clearly able to describe their experimental design process from design to collection of data to descriptive report of their results. Students complete a minimum of 2 projects each semester. Some of these projects are completed during class time, while the others are completed outside of class. The library has computers for student use that are loaded with Minitab.

## Remarks

We believe that AP Statistics should incorporate activities in which students routinely use technology to construct their own understanding of the principles and practices of statistics. Therefore, the following syllabus relies heavily on student's active engagement in "d oing" statistics (exploring and analyzing data, assessing models, and performing simulations) with appropriate technology tools throughout the course, including:

- Minitab statistical Software
- TI-83 and TI-83+ graphing calculators

**AP STATISTICS**

***Stats: Modeling the World,* 2nd edition**

Bock, Velleman, De Veaux; Pearson/Addison-Wesley, 2007

**First Marking Period** **First Semester Total: 44 blocks**

Unit I: Exploring and Understanding Data
- Chapter 1-3
- Chapter 4
- Chapter 5
- Chapter 6

8 blocks

Unit II: Exploring Relationships Between Variables
- Chapter 7
- Chapter 8
- Chapter 9
- Chapter 10

9 blocks

Unit III: Gathering Data
- Chapter 11
- Chapter 12
- Chapter 13

6 blocks **Total: 23 blocks**

**Second Marking Period**

Unit IV: Randomness and Probability
- Chapter 14
- Chapter 15
- Chapter 16
- Chapter 17

8 blocks

Unit V: From the Data at Hand to the World at Large
- Chapter 18
- Chapter 19
- Chapter 20

9 blocks

First Semester Exam Review

3 blocks

First Semester Exam

1 block **Total: 21 blocks**

**Third Marking Period**

Chapter 21
Chapter 22
5 blocks

Unit VI: Learning About the World

Chapter 23
Chapter 24
Chapter 25
9 blocks

Unit VII: Inferences When Variables Are Related

Chapter 26
Chapter 27
6 blocks **Total: 20 blocks**

**Fourth Marking Period**

AP Exam Review
12 blocks

AP Exam
1 block

Chapter 28
Chapter 29
5 blocks

OR

Cumulative Project
7 blocks **Total: 25 blocks**

**Second Semester Total: 45 blocks**

## PRIMARY TEXTBOOK REFERENCES AND RESOURCE MATERIALS
## (Noted with the following letters in the Course outline)

**T** Bock, David E., Pau F. Velleman, and Richard D. DeVeaux. Stats: Modeling the World, 2nd edition. Boston: Pearson/Addison Wesley, 2007.

**TX** Moore, David S., and George P. McCabe. Introduction to the Practice of Statistics. 4th ed. New York: W. H. Freenan, 2002.

**WK** Rossman, Allan J., and Beth L. Chance. Workshop Statistics: Discovery with Data and Minitab. 2nd ed. New York: Key College, 2000.

**RV** Heller, Lerer, Montgomery & Piccolino. AP Statistics: Multiple –Choice and Free-Response Questions in Preparation for the AP Statistics Examination. D&S Marketing Systems, Inc., 2003.

**PP** Power Point Presentation, 2/E. Bock, Velleman & DeVeaux, Addison-Wesley/Electronic Supplement, 2007.

**TI** Texas Instrument, TI-83 plus graphing calculator.

**O** Other resource materials used in the classroom come from articles in newspapers, journals and the World Wide Web.

**W** Worksheets for reinforcement, introduction of concepts, or review.

**HW** Homework assignments from the Moore & McCabe textbook.
Some problems are worked in class as discussion problems.

**RG** Reading Guides, Guided questions that emphasize the utilization of statistical terminology (vocabulary) and overall themes and objectives that are required to analyze, interpret, and draw conclusion from statistical data.

**TR** Bock, David E., and William B. Craine, III. Printed Test Bank and Resource Guide. To accompany Stats: Modeling the World, 2nd edition.

| Unit I: Exploring and Understanding Data | | | | | | |
|---|---|---|---|---|---|---|
| *Exploring Data: Describing patterns and departures from patterns (20% –30%)*<br>*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.* | | | | | | |
| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 1 | 1 | Stats Starts Here | p. 2-6 | 1/3 | | TI, PP, HW, W, RG |
| | 2 | Data | p. 7-19 | 1/3 | #4, 5, 7, 11, 25, 26 | TI, PP, HW, W, RG |
| | 3 | Displaying and Describing Categorical Data | p. 20-44 | 1/3 | # 5, 7, 14, 18, 22, 38 | TI, PP, HW, W, RG |
| | | *Exploring categorical data*<br>▪ *Frequency tables and bar charts*<br>▪ *Marginal and joint frequencies for two-way tables*<br>▪ *Conditional relative frequencies and association*<br>▪ *Comparing distributions using bar charts* | | | | |
| 2 | 4 | Displaying Quantitative Data | p. 45-72 | 1 | #4, 5, 9, 12, 15, 18, 20, 23, 25, 32, 36, 38b | TI, PP, HW, W, O, WK, RG |
| | | *Constructing and interpreting graphical displays of distributions of univariate data (dotplot, stemplot, histogram, cumulative frequency plot)*<br>▪ *Center and spread*<br>▪ *Clusters and gaps*<br>▪ *Outliers and other unusual features*<br>▪ *Shape* | | | | |
| 3 | | Review/Quiz | | 1 | | W |
| 4 | 5 | Describing Distributions Numerically | p. 73-101 | 1 | #3, 4, 5, 7, 8, 10, 12, 13, 19, 28, 31, 35abc, 37, 42, 47 | TI, PP, HW, W, RG |
| | | *Summarizing distributions of univariate data*<br>▪ *Measuring center: median, mean*<br>▪ *Measuring spread: range, interquartile range, standard deviation*<br>▪ *Measuring position: quartiles, percentiles, standardized scores (z-scores)*<br>▪ *Using boxplots*<br>▪ *The effect of changing units on summary measures* | | | | |
| | | *Comparing distributions of univariate data (dotplots, back-to-back stemplots, parallel boxplots)*<br>▪ *Comparing center and spread: within group, between group variation*<br>▪ *Comparing clusters and gaps*<br>▪ *Comparing outliers and other unusual features* | | | | |

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|---|---|---|---|---|---|---|
| | | ▪ *Comparing shapes* | | | | |
| 5<br>6 | 6 | The Standard Deviation as a Ruler and the Normal Model | p. 102-129 | 2 | #2, 3, 6, 8, 11, 14, 18, 19, 22, 24, 30, 32, 34, 37, 42, 45 | TI, PP, HW, W, WK, RG |
| | | *The normal distribution*<br>▪ *Properties of the normal distribution*<br>▪ *Using tables of the normal distribution*<br>▪ *The normal distribution as a model for measurements* | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |
| 7 | | Review | p. 130-140 | 1 | | W |
| 8 | | Test | | 1 | | |
| | | | | 8 | | |

| Unit II: Exploring Relationships Between Variables | | | | | | |
|---|---|---|---|---|---|---|
| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 9 | 7 | Scatterplots, Association, and Correlation | p. 142-167 | 1 | #2, 6, 7, 10, 12, 13, 16, 18, 21, 23, 26, 29, 30, 33 | TI, PP, HW, W, O, RG |
| | | *Exploring bivariate data*<br>▪ *Analyzing patterns in scatterplots*<br>▪ *Correlation and linearity* | | | | |
| 10<br>11 | 8 | Linear Regression | p. 168-197 | 2 | #1, 4, 10, 12, 14, 16, 20, 25, 28, 31, 36, 40, 45, 49 | TI, PP, HW, W, WK, RG |
| | | ▪ *Least-squares regression line* | | | | |
| 12 | | Review/Quiz | | 1 | | W |
| 13 | 9 | Regression Wisdom | p.198-219 | 1 | #2, 5, 7, 9, 10, 11, 14, 16, 24 | TI, PP, HW, W, RG |
| | | ▪ *Residual plots, outliers, and influential points* | | | | |
| 14<br>15 | 10 | Re-expressing Data: Get It Straight! | p. 220-243 | 2 | #3, 5, 10, 11, 12, 24ab, 25, 31 | TI, PP, HW, W, RG |
| | | ▪ *Transformations to achieve linearity: logarithmic and power transformations* | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |
| 16 | | Review | p. 244-254 | 1 | #1, 2, 5, 6, 8, 9, 12, 15, 16, 19, 25, 27, 31, 42 | W |
| 17 | | Test | | 1 | | |
| | | | | 9 | | |

| Unit III: Gathering Data | | | | | | |
|---|---|---|---|---|---|---|
| *Sampling and Experimentation: Planning and conducting a study (10% –15%)*<br>*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.* | | | | | | |
| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 18 | 11 | Understanding Randomness | p. 257-269 | 1 | #1, 2, 5ab, 7, 9, 11, 13, 19, 22, 35 | TI, PP, HW, W, RG |
| 19 | 12 | Sample Surveys | p. 270-292 | 1 | #1, 4, 7, 13, 15, 19, 26, 28, 31 | PP, HW, W, RG |
| | | *Overview of methods of data collection*<br>▪ *Census*<br>▪ *Sample survey*<br>▪ *Experiment*<br>▪ *Observational study* | | | | |
| | | *Planning and conducting surveys*<br>▪ *Characteristics of a well-designed and well-conducted survey*<br>▪ *Populations, samples, and random selection*<br>▪ *Sources of bias in sampling and surveys*<br>▪ *Sampling methods, including simple random sampling, stratified random sampling, and cluster sampling* | | | | |
| 20 | | Review/Quiz | | 1 | | W |
| 21 | 13 | Experiments and Observational Studies | p. 293-318 | 1 | #3, 8, 15, 25, 27, 32, 38, 43 | PP, HW, W, RG |
| | | *Planning and conducting experiments*<br>▪ *Characteristics of a well-designed and well-conducted experiment*<br>▪ *Treatments, control groups, experimental units, random assignments, and replication*<br>▪ *Sources of bias and confounding, including placebo effect and blinding*<br>▪ *Completely randomized design*<br>▪ *Randomized block design, including matched pairs design* | | | | |
| | | *Generalizability of results and types of conclusions that can be drawn from observational studies, experiments, and surveys* | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |

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|---|---|---|---|---|---|---|
| 22 | | Review | p. 319-324 | 1 | | W |
| 23 | | Test | | 1 | | |
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| Unit IV: Randomness and Probability | | | | | | |
|---|---|---|---|---|---|---|
| *Anticipating Patterns: Exploring random phenomena using probability and simulation (20% –30%)*<br>*Probability is the tool used for anticipating what the distribution of data should look like under a given model.* | | | | | | |
| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 24 | 14 | From Randomness to Probability | p. 326-343 | 1 | #10, 11, 21-23, 27-29 | TI, PP, HW, W, RG |
| | | *Probability*<br>▪ *Interpreting probability, including long-run relative frequency interpretation*<br>▪ *"Law of Large Numbers" concept* | | | | |
| 25 | 15 | Probability Rules! | p. 344-367 | 1 | #7, 9, 13, 19, 21, 27, 34 | TI, PP, HW, W, RG |
| | | ▪ *Addition rule, multiplication rule, conditional probability, and independence* | | | | |
| 26 | | Review/Quiz | | 1 | | W |
| 27 | 16 | Random Variables | p. 368-385 | 1 | #6, 16, 19, 25, 32, 37 | TI, PP, HW, W, RG |
| | | ▪ *Simulation of random behavior and probability distributions*<br>▪ *Mean (expected value) and standard deviation of a random variable, and linear transformation of a random variable* | | | | |
| | | *Combining independent random variables*<br>▪ *Notion of independence versus dependence*<br>▪ *Mean and standard deviation for sums and differences of independent random variables* | | | | |
| 28 | | Review/Quiz | | 1 | | W |
| 29 | 17 | Probability Models | p. 386-401 | 1 | #6, 11-13, 15, 24, 25 | TI, PP, HW, W, WK, RG |
| | | ▪ *Discrete random variables and their probability distributions, including binomial and geometric* | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |
| 30 | | Review | p. 402-408 | 1 | | W |
| 31 | | Test | | 1 | | |
| | | | | 8 | | |

| Unit V: From the Data at Hand to the World at Large | | | | | | |
|---|---|---|---|---|---|---|
| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 32<br>33 | 18 | Sampling Distribution Models | p. 410-431 | 2 | #1, 7, 10, 12, 14, 16, 17, 20, 21, 23, 24, 25, 26, 36 | TI, PP, HW, W, O, RG |
| | | *Sampling distributions*<br>▪ *Sampling distribution of a sample proportion*<br>▪ *Sampling distribution of a sample mean*<br>▪ *Central Limit Theorem*<br>▪ *Simulation of sampling distributions* | | | | |
| 34<br>35 | 19 | Confidence Intervals for Proportions | p. 432-450 | 2 | #2, 4, 5, 6, 7, 10, 12, 13, 18, 20, 24, 28, 31, 33, 38 | TI, PP, HW, W, O, RG |
| | | ▪ *Logic of confidence intervals, meaning of confidence level and confidence intervals, and properties of confidence intervals*<br>▪ *Large sample confidence interval for a proportion*<br>▪ *Confidence interval for a mean*<br>▪ *Estimating population parameters and margins of error*<br>▪ *Properties of point estimators, including unbiasedness and variability*<br>* Define the unknown parameter as our "point estimator", which is defined as our "statistic." | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |
| 36 | | Review | | 1 | #2, 4, 7, 8, 9, 10, 12, 13, 18, 20, 24, 25 | W |
| 37 | | Test (Part I) | | 1 | | |

| Unit V (continued): From the Data at Hand to the World at Large | | | | | | |
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| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 38<br>39 | 20 | Testing Hypotheses About Proportions | p. 451-472 | 2 | #2, 4, 5, 6, 8, 10, 11, 14, 15, 17, 19, 20, 23 | TI, PP, HW, W, RG |
| | | ▪ *Logic of significance testing, null and alternative hypotheses; p-values; one- and two-sided tests* | | | | |
| 40 | | Review/Quiz | | 1 | | W |
| 41<br>42 | 21 | More About Tests | p. 473-494 | 2 | #2, 4, 5, 8, 9, 12, 15, 18, 19, 23, 27 | TI, PP, HW, W, O, RG |
| | | ▪ *Concepts of Type I and Type II errors; concept of power*<br>▪ *Large sample test for a proportion* | | | | |
| 43 | 22 | Comparing Two Proportions | p. 495-511 | 1 | #2, 4, 5, 8, 10, 11, 16, 19, 24, 27 | TI, PP, HW, W, RG |
| | | ▪ *Sampling distribution of a difference between two independent sample proportions*<br>▪ *Sampling distribution of a difference between two independent sample means*<br>▪ *Large sample confidence interval for a difference between two proportions*<br>▪ *Large sample test for a difference between two proportions* | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |
| 44 | | Review | p. 512-518 | 1 | | W |
| 45 | | Test (Part 2) | | 1 | | |
| | | | | 14 | | |

| Unit VI: Learning About the World | | | | | | |
|---|---|---|---|---|---|---|
| *Statistical Inference: Estimating population parameters and testing hypotheses (30% –40%)*<br>*Statistical inference guides the selection of appropriate models.* | | | | | | |
| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 46<br>47 | 23 | Inferences About Means | p. 520-546 | 2 | #1, 3, 4, 6, 8, 9, 11, 13, 17, 19, 21, 23, 26, 29 | TI, PP, HW, W, RG |
| | | ▪ *t-distribution*<br>▪ *Test for a mean* | | | | |
| 48 | | Review/Quiz | | 1 | | W |
| 49<br>50 | 24 | Comparing Means | p. 547-573 | 2 | #1, 3, 5, 8a-c, 10, 13, 15, 17, 19, 23, 24, 26, 32, 33 | TI, PP, HW, W, RG |
| | | *Test for a difference between two means (unpaired and paired)* | | | | |
| 51 | 25 | Paired Samples and Blocks | p. 574-594 | 1 | #1, 4, 5, 7, 9, 11, 17, 19, 23 | TI, PP, HW, W, RG |
| | | *Confidence interval for a difference between two means (unpaired and paired)* | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |
| 52<br>53 | | Review | p. 595-604 | 2 | | W |
| 54 | | Test | | 1 | | |
| | | | | 9 | | |

| Unit VII: Inference When Variables Are Related | | | | | | |
|---|---|---|---|---|---|---|
| **Lesson** | **Chapter** | **Objectives** | **Pages (T)** | **Time** | **Homework** | **Resources** |
| 55<br>56 | 26 | Comparing Counts | p. 606-633 | 2 | #4, 8, 11, 13, 16, 18, 21, 22, 25, 30 | TI, PP, HW, W, O, RG |
| | | ▪ *Chi-square distribution*<br>▪ *Chi-square test for goodness of fit, homogeneity of proportions, and independence (one- and two-way tables)* | | | | |
| 57 | | Review/Quiz | | 1 | | W |
| 58 | 27 | Inference for Regression | p. 634-669 | 1 | #2, 3, 6, 9, 10, 16, 18, 20, 26, 36 | TI, PP, HW, W, RG |
| | | ▪ *Confidence interval for the slope of a least-squares regression line*<br>▪ *Test for the slope of a least-squares regression line* | | | | |
| | | Investigative Task: Culminating unit activity designed to incorporate the objectives of the unit and the themes of statistical process. Students will write a formal written report summarizing the design, analysis, and conclusions of their findings. | | | | TR |
| 59 | | Review | | 1 | | W |
| 60 | | Test | | 1 | | |
| | | | | 6 | | |