# El Monte Union High School District

## Course Outline

**District: <u>EMUHSD</u>**
**High School:    ALL**

Course Title: <u>Statistics AP P</u>

Textbook(s): The Practice of Statistics

Copyright date/Edition: 2014/5<sup>th</sup> Ed.

Transitional*_____(Eng. Dept. Only)

Sheltered (SDAIE)*___Bilingual*___

AP**__X___Honors**_____

Department: <u>Mathematics</u>

CTE*** :
Industry Sector:_____
Pathway:_____

Check One
Introductory:_____
Concentrator:_____
Capstone:_____

Grade Level (s):_____11-12_____

Semester_____Year__X_____

Year of State Framework Adoption_____

This course meets graduation requirements:

( )    English
( )    Fine Arts
( )    Foreign Language
( )    Health & Safety
( )    Math
( )    Physical Education
( )    Science
( )    Social Science
( )    Elective

This course meets a-g requirements:

( )    "a" – Social Studies
( )    "b" – ELA
(x )    "c" – Math
( )    "d" – Lab Science
( )    "e" – Language (not English)
( )    "f" – Vis/Perf Arts
( )    "g" – College prep elective

Department/Cluster Approval        Date

_____        _____

_____        _____

_____        _____

_____        _____

_____        _____

_____        _____

_____        _____

Is this course an adaptation from another source?
  □   No
  □   Yes

If yes, please indicate the source of the original course:

_____

_____

*Instructional materials appropriate for English Language Learners are required.

**For AP/Honors course **attach a page** describing how this course is above and beyond a regular course.  Also, explain why this course is the equivalent of a college level class.

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***For CTE, **attach the CTE course outline** created in the online template ([http://ctecourse.scoe.net/](http://ctecourse.scoe.net/)).

1. **Prerequisite(s):**

   - B or better in Integrated Math 3 or equivalent OR teacher recommendation.

2. **Short description of course which may also be used in the registration manual:**

   The AP Statistics course is equivalent to an introductory, non-calculus-based college level 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.

3. **Describe how this course integrates the schools SLO (former ESLRs- Expected School-wide Learning Results):**

   The AP Statistics course lends itself naturally to a mode of teaching that engages students in constructing their own knowledge.  For example, students working individually or in small groups can plan and perform data collection and analyses where the teacher serves in the role of a consultant, rather than a director.  This approach gives students ample opportunity to think through problems, make decisions and share questions and conclusions with other students as well as with the teacher.

4. **Describe the additional efforts/teaching techniques/methodology to be used to meet the needs of English Language Learners:**

   The special needs of English language learners are met throughout the course in a number of ways:
   a. By using the Sheltered Instruction Observation Protocol (SIOP) or other researched based strategies that engage students in learning and communicating their thoughts in the four language domains.
   b. By probing prior knowledge to connect existing knowledge with knowledge to be learned
   c. By teaching concepts for which English learners may not have a cultural reference, including obscure terms, and academic vocabulary
   d. By defining abstract concepts in concrete terms, and using specific examples
   e. By using graphic organizers and rubrics to set expectations and facilitate organization of though
   f. By using a variety of other audio/visual aids during instruction, such as pictures, films, and realia
   g. By encouraging students to express themselves in a variety of modalities
   h. By satisfying student needs as outlined by each student's active IEP.

5. **Describe the interdepartmental articulation process for this course:**

   Important components of the course include the use of technology, projects and laboratories, cooperative group problem-solving, and writing, as a part of concept-oriented instruction and assessment.  This approach to teaching AP Statistics will allow students to build interdisciplinary connections with other subjects and with their world outside school.  Statistics can basically be used in all or most fields of study.  These include the areas of business, science, mathematics, athletics, and any social studies area.

6.  **Describe how this course will integrate academic and vocational concepts, possibly through connecting activities. Describe how this course will address work-based learning/school to career concepts:**

    Students learn statistics best by doing statistics. Each chapter contains several activities that have students explore new content and investigate important concepts. In addition, students will complete real-world applications at the end of each lesson and the end of each chapter. Students will also complete at least one major project each semester where they design a study, collect data, and analyze the results.

    Learning targets are presented at the end of each lesson so students know what they are expected to learn. These targets are repeated at the end of each lesson in a grid that matches each target with a set of exercises and an example in the text.

    The emphasis in this course is not only in the manipulation of data, but the actual collection of real, in context, data. Unlike many traditional courses that emphasize only in theory and manipulation, this course teaches students why they need various statistics, what it actually means, and how to use it in a "real" sense.

7.  **Materials of Instruction (Note: Materials of instruction for English Language Learners are required and should be listed below.)**

    A.  Textbook(s) and Core Reading(s):
        The Practice of Statistics 5$^{th}$ Edition by Daren Starnes and Josh Tabor (Bedford, Freeman, & Worth)
    B.  Supplemental Materials and Resources:
        - Glosario for EL Learners
        - Textbook online resources
        - Teacher made resources
        - Overhead transparencies or documents for projection
        - Extra practice worksheets
        - Manipulatives
        - Materials found on-line: projects; performance tasks, problems of the week...
    C.  Tools, Equipment, Technology, Manipulatives, Audio-Visual:
        - Examview worksheet Generator
        - Illuminate Item Bank
        - Graphing Calculators (TI-83/84)
        - Projectors
        - Document Readers
        - Chromebooks

8. **(See Below and Attached)**

- Objectives of Course:
  The purpose of the AP course in statistics is to introduce students to the major concepts and tools for collecting, analyzing and drawing conclusions from data. Students are exposed to four broad conceptual themes:
  1. Exploring Data: Describing patterns and departures from patterns
  2. Sampling and Experimentation: Planning and conducting a study
  3. Anticipating Patterns: Exploring random phenomena using probability and simulation
  4. Statistical Inference: Estimating population parameters and testing hypotheses

  Students who successfully complete the course and exam may receive credit, advanced placement or both for a one-semester introductory college statistics course.

- **Unit detail including projects and activities including duration of units**
  SEE ATTACHED DOCUMENT

- **Indicate references to state framework(s)/standards (If state standard is not applicable then national standard should be used)**
  SEE ATTACHED DOCUMENT

- **Student performance standards**

  *Common Core Standards for Mathematical Practices:*
  - 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.

  *Guidelines for Grading:*
  |   |   |
  |---|---|
  | A | 90-100% |
  | B | 80-89% |
  | C | 70-79% |
  | D | 60-69% |
  | F | 59% and below |

  *Evaluation/assessment/rubrics*
  - Formative and Summative Assessments
    - Chapter Tests
    - Quizzes

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- Homework/Classwork Practice
  - Projects
  - Performance Tasks

*AP Exam Scores*

The Readers' scores on the free-response questions are combined with the results of the computer-scored multiple-choice questions; the weighted raw scores are summed to give a composite score. The composite score is then converted to a score on AP's 5-point scale. While colleges and universities are responsible for setting their own credit and placement policies, AP scores signify how qualified students are to receive college credit or placement:

| AP SCORE | QUALIFICATION |
|----------|---------------|
| 5 | Extremely well qualified |
| 4 | Well qualified |
| 3 | Qualified |
| 2 | Possibly qualified |
| 1 | No recommendation |

AP Exam scores of 5 are equivalent to A grades in the corresponding college course. AP Exam scores of 4 are equivalent to grades of A–, B+ and B in college. AP Exam scores of 3 are equivalent to grades of B–, C+ and C in college.

- **Include minimal attainment for student to pass course**
  Students must attain at least 60% overall average for all assignments (Tests, Quizzes, Homework, Classwork, Notes, etc.) for the course.

# Please see attachments for unit details and standards alignment

**Course Content Overview**
The topics for AP Statistics are divided into four major themes: exploratory analysis (20–30 percent of the exam), planning and conducting a study (10–15 percent of the exam), probability (20–30 percent of the exam), and statistical inference (30–40 percent of the exam).

I. *Exploratory analysis of data makes use of graphical and numerical techniques to study patterns and departures from patterns.* In examining distributions of data, students should be able to detect important characteristics, such as shape, location, variability and unusual values. From careful observations of patterns in data, students can generate conjectures about relationships among variables. The notion of how one variable may be associated with another permeates almost all of statistics, from simple comparisons of proportions through linear regression. The difference between association and causation must accompany this conceptual development throughout.

II. *Data must be collected according to a well-developed plan if valid information is to be obtained.* 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.

III. *Probability is the tool used for anticipating what the distribution of data should look like under a given model.* Random phenomena are not haphazard: they display an order that emerges only in the long run and is described by a distribution. The mathematical description of variation is central to statistics. The probability required for statistical inference is not primarily axiomatic or combinatorial but is oriented toward using probability distributions to describe data.

IV. *Statistical inference guides the selection of appropriate models.* 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. Inference from data can be thought of as the process of selecting a reasonable model, including a statement in probability language, of how confident one can be about the selection.

**Course Outline**

**Part I – Exploring Data with Descriptive Statistics**

      1. Exploring Data (Univariate Data)
          1.1 Analyzing Categorical Data
          1.2 Displaying Quantitative Data with Graphs
          1.3 Describing Quantitative Data with Numbers
      2. Modeling Distributions of Data (Univariate Data)
          2.1 Describing Location in a Distribution
          2.2 Density Curves and Normal Distributions
      3. Describing Relationships (Bivariate Data)

## **AP Statistics Curriculum Guide and CCSS Alignment**

### **Unit 1**

| | **Topics** | Textbook (TPS) | Common Core Standards | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| **7 days** | 1. Bar Graphs and Pie Charts<br>2. Two-Way Tables and Marginal Distribution<br>3. Relationships between Categorical Variables<br>4. Conditional Distributions<br>5. Dotplots, Describing Shape, Comparing Distributions, Stem plots<br>6. Histograms<br>7. Measuring Center: Mean and Median, comparing Mean and Median,<br>8. Measuring Spread: IQR, Identifying Outliers<br>9. Five Number Summary and Boxplots, measuring Spread: Standard Deviation, Choosing Measures of Center and Spread | 1.1-1.3 | S.ID.1, S.ID.2, S.ID.3, S.ID.5 | IA, IB, IC, IE | 2000: 3<br>2001: 1<br>2002: 5<br>2004: 1<br>2005B: 1<br>2006: 1<br>2007B: 1<br>2010B: 1<br>2011B: 1 | 1997: 10,14,21,22,30<br><br>2002: 7,14,20,27,28<br><br>2007: 1,7,12,15,18,24,29,40 |

### **Unit 2**

| **Topics** | Textbook | Common Core | Relationship to AP Statistics | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|

1

| | | | Course Description | | |
|---|---|---|---|---|---|
| **5 days** | 1. Measuring Position:  Percentiles; Cumulative Relative Frequency Graphs; Measuring Position:  z-scores<br>2. Transforming Data:  Density Curves<br>3. The 68-95-99.7 Rule; The Standard Normal Distribution<br>4. Normal Distribution Calculations<br>5. Assessing Normality | 2.1-2.2 | S.ID.4 | IA, IB3, IB5, IIIC1, IIIC2, IIIC4 | 1997: 1<br>2006B: 1<br>2008: 1<br>2009: 1<br>2011: 1 | 1997: 12,15,17,25,32<br><br>2002:  3,10<br><br>2007:  3,8,22 |

## Unit 3

| Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|
| | | | | | |

2

| | Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| **5 days** | 1. Explanatory and response variables<br>2. Displaying relationships: scatterplots<br>3. Interpreting scatterplots<br>4. Measuring linear association: correlation<br>5. Facts about correlation<br>6. Least-squares regression<br>7. Interpreting a regression line<br>8. Prediction<br>9. Residuals and the least-square regression line<br>10. Calculating the equation of the least-squares regression line<br>11. Residual plots<br>12. Role of $r^2$ in regression.<br>13. Interpreting computer regression output<br>14. Correlation and regression wisdom | 3.1-3.2 | S.ID.6, S.ID.7, S.ID.8, S.ID.9 | ID1, ID2, ID3, ID4, ID5 | 1998: 2<br>1998: 4<br>1999: 1<br>2000: 1<br>2002: 4<br>2002B: 1<br>2003B: 1<br>2005: 3<br>2007B: 4<br>2011: 5 | 1997: 31<br><br>2002: 6, 17,34<br><br>2007: 10,19 |

## Unit 4

| Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|
| | | | | | |

3

| 7 days | 1. Sample Survey<br>2. Random Sampling<br>3. SRS vs. stratified random sample or cluster sample<br>4. Inference for Sampling (undercoverage, non-response, wording)<br>5. Observational Study vs. Experiment<br>6. Principles of experimental design<br>7. Inference for Experiments<br>8. Blocking, Matched Pair Design<br>9. Scope of Inference, Challenges of Causation<br>10. Class Experiments or Data Ethics (optional) | 4.1-4.3 | S.ID.9, S.IC.3 | IIA, IIB, IIC1, IIC2, IIC3, IIC4, IIC5, IID | 1997:2  1999: 3<br>2000: 5  2001: 4<br>2002: 2  2002B: 3<br>2003:4  2004: 2<br>2004B: 2  2005: 1<br>2006:5  2007: 2<br>2008: 2  2009: 3<br>2010: 1  2010B: 2<br>2011:3  2011 B:2 | 1997: 8,9,15,27<br><br>2002: 1,15,16,22,25<br><br>2007: 2,9,14,20,31,35 |

## Unit 5

| | Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| 7 days | 1. Simulation<br>2. Probability Models<br>3. Two-Way Tables and Probability, Venn Diagrams and Probability<br>4. Conditional Probability and Independence, Tree Diagrams and General Multiplication Rule<br>5. Calculating Conditional Probabilities | 5.1-5.3 | S.ID.5, S.IC.2, S.CP.1, S.CP.2, S.CP.3,S.CP.4,S.CP.5,S.CP.6,S.CP7, S.CP.8, S.MD.6,S.MD.7 | IE1, IE2, IE3, IE4, IIIA1, IIIA2, IIIA3, IIIA4, IIIA5, IIIA6 | 1997: 3<br>2001: 3<br>2003B: 2<br>2009B: 2<br>2011: 2 | 1997:  13<br><br>2002:  4,23<br><br>2007: 6,11,16,36 |

4

## Unit 6

| | Topics | Textbook | Common Core | Relationship to AP Statistics Course of Study | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| **6 days** | 1. Discrete Random Variables, Mean (Expected Value of a Discrete Random Variable)<br>2. Standard Deviation (and Variance) of Discrete Random Variable, Continuous Random Variables<br>3. Linear Transformation<br>4. Combining Random Variables, Combining Normal Random Variables<br>5. Binomial Settings and Binomial Random Variables, Binomial Probabilities<br>6. Mean and Standard Deviation of a Binomial Distribution, Binomial Distributions in Statistical Sampling<br>7. Geometric Random Variables | 6.1-6.3 | S.IC.2, S.MD.1, S.MD.2,S.MD.3, S.MD.4,S.MD.5, S.MD.6,S.MD.7 | IIIA1, IIIA2, IIIA3, IIIA4, IIIA5, IIIA6, IIIB1, IIIB2 | 1998: 6   1999: 4, 5<br>2001: 2   2002: 3<br>2002B: 2<br>2003: 3<br>2004: 4   2005: 2<br>2005B: 2<br>2006B: 3<br>2008: 3<br>2008B: 5<br>2010: 4<br>2010B: 3<br>2011B: 3 | 1997: 3,4,11,19,23,26<br><br>2002:  5,32<br><br>2007: 25,26,39 |

## Unit7

| | Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| | | | | | | |

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| | | 7.1-7.3 | N/A | IIID1, IIID2, IIID3, IIID4, IIID5, IIID6, IIID7, IIID8 | 1998: 1 2004B: 3 2006: 3 2007: 3 2007B: 2 2008: 2 2009: 2 2010: 2 | 1997: 20 2002: 30,36 2007: 23, 38 |
|---|---|---|---|---|---|---|
| **6 days** | 1. Sampling Variability, Describing Sampling Distribution 2. Sampling Distribution of $\hat{p}$, Using the Normal Approximation for $\hat{p}$ 3. Sampling Distribution of $\bar{x}$; Mean and Standard Deviation, Sampling from a Normal Population 4. Central Limit Theorem | | | | | |

## Unit 8

| | **Topics** | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| **7 days** | 1. Confidence Interval, Interpreting Confidence Levels and Confidence Intervals, Constructing a Confidence Interval 2. Conditions from Estimating p, Constructing a Confidence Interval for p 3. Four-Step Process, Choosing a Sample Size 4. When $\sigma$ is known: The One-Sample z Interval for a Population Mean, When $\sigma$ is Unknown: The t Distributions, Constructing a Confidence Interval for $\mu$ 5. Using t Procedures Wisely | 8.1-8.3 | S.IC.1 | IIID7, IVA1, IVA2, IVA3, IVA4, IVA5, IVA6, IVA7, IVA8 | 2000: 2, 6 2002: 1 2002B: 4 2003: 6 2003B: 6 2005: 5 2008B: 3 2010: 3 2010B: 4 2011: 8 2011B: 5,6 | 1997: 1,7,16,24,33,35 2002: 8,9,13,18,26,29,33,37,40 2007: 33, 34 |

## Unit 9

6

| | Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| 7 days | 1. Reasoning of Significance Tests, Stating Hypotheses, Interpreting P-values, Statistical Significance<br>2. Type 1 and Type II Errors, Planning Studies: Power of a Statistical Test<br>3. Carrying out a Significance Test, The One-Sample z Test for a Proportion<br>4. Two-Sided Tests, Why Confidence Intervals Give More Information<br>5. Carrying Out a Significance Test for $\mu$, The One-Sample t Test, Two-sided Tests and Confidence Intervals<br>6. Inference for Means: Paired Data, Using Tests Wisely | 9.1-9.3 | N/A | IVA.7, IVB1, IVB2, IVB3, IVB4, IVB5, IVB6, IVB7 | 1997: 5  1998: 5 1999: 6  2001: 5<br>2003: 1, 2<br>2004:6<br>2005: 4<br>2005B:4,6<br>2006B: 4,6<br>2007:4<br>2008B: 4,6<br>2009:6<br>2009B: 4,5 | 1997: 2,6,29,34<br><br>2002: 2,24,38,39<br><br>2007: 5,21,27,30 |

## Unit 10

| Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|
| | | | | | |

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| | Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| **5 days** | 1. Sampling Distribution of a Difference between Two Proportions<br>2. Confidence Intervals for $p_1 - p_2$<br>3. Significance Tests for $p_1 - p_2$, Inference for Experiments<br>4. Sampling Distribution of a Difference between Two Means<br>5. Two-Sample t Statistic, Confidence Intervals for $\mu_1 - u_2$<br>6. Significance Tests for $\mu_1 - u_2$, Using Two-Sample t Procedures Wisely | 10.1-10.2 | S.IC.5 | IIID4, IIID5, IVA5, IVA7, IVB3, IVB7 | 1997:4  2000:4<br>2002:5,6<br>2003B:3<br>2004B:5, 6<br>2005:6<br>2005B:3<br>2006:4<br>2006B:2<br>2007:1,2<br>2007B:5<br>2008:4  2008B: 1<br>2009:4, 5<br>2009B: 3,6<br>2010: 5 | 1997:  5<br><br>2002:  12<br><br>2007:  4,13,37 |

## Unit 11

| | **Topics** | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| | | | | | | |

| 5 days | 1. Comparing Observed and Expected Counts: The Chi-Square Statistic, The Chi-Square Distributions and P-values<br>2. The Chi-Square Goodness-of-Fit Test, Follow-Up Analysis<br>3. Comparing Distributions of a Categorical Variable, Expected Counts and the Chi-Square Statistic, The Chi-Square Test for Homogeneity, Follow-Up Analysis, Comparing Several Populations<br>4. Chi-Square Test of Association/Independence | 11.1-11.2 | S.IC.2 | IIID8, IVB6 | 1998:3  1999:2 2002B: 6  2003: 5<br>2003B: 5<br>2004:5<br>2006: 6  2008: 5<br>2009: 1  2010: 6<br>2010:5  2011: 4<br>2011B: 4 | 1997:  n/a<br><br>2002:  11,19<br><br>2007:  17 |

## Unit 12

| | Topics | Textbook | Common Core | Relationship to AP Statistics Course Description | AP Released FR Questions | AP Released MC Questions |
|---|---|---|---|---|---|---|
| 5 days | 1. Sampling Distribution of b, Conditions for Regression Inference<br>2. Estimating Parameters, Constructing a Confidence Interval for the Slope<br>3. Performing a Significance Test for the Slope<br>4. Transforming with Powers and Roots<br>5. Transforming with Logarithms | 12.1-12.2 | N/A | ID5, IVA8, IVB7 | 1997:6  2001: 6 2004B:1<br>2005B:5<br>2006: 2  2007:6<br>2007B: 6<br>2008:6<br>2010B:6 2011: 5 | 1997:  28<br><br>2002: 21,31,35<br><br>2007:  28,32 |

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