AP Statistics Syllabus
CHS Mathematics Department

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* Google Classroom

CCSD Vision Statement: The Chillicothe City School District will provide tomorrow's leaders with a high quality education by developing high expectations and positive personal relationships among students, staff, and community members.

CCSD Mission Statement: The Chillicothe City School District empowers students to learn, to lead, and to serve.

Course Description and Prerequisite(s) from Course Handbook:
Advanced Placement Statistics - 268
State Course #: 119550
Prerequisite: Students must have attained a "B+" or better in Algebra II and Geometry/ "B" in Honors Algebra II and Honors Geometry and gain teacher approval
Elective   Grade: 11-12
Weighted Grade   Credit: 1
Course Description:
         This AP course is designed for the advanced math student. 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: Exploring Data: Describing patterns and departures from patterns, Sampling and Experimentation: Planning and conducting a study, Anticipating Patterns: Exploring random phenomena using probability and simulation, and Statistical Inference: Estimating population parameters and testing hypotheses.

Students are expected to take and pay for the AP exam. If the student fails to take the exam, a 4.5 point grading scale will be applied to the course. The course is designed to prepare students to perform well on the examination. A student who earns a 3 or above on the exam will be granted college credit at most colleges and universities throughout the United States.

<u>Learning Targets:</u> Defined below for clarity are the Unit Titles, Big Ideas of every Unit taught during this course, and the Essential Questions to be answered to better understand the Big Ideas. A student's ability to grasp and answer the Essential Questions will define whether or not he or she adequately learns and can apply the skills found in Big Ideas. This will ultimately define whether or not a student scores well on assessments administered for this course.

- <u>1st Quarter</u>
  - Unit I Title: Exploring and Understanding Data (Univariate)
    - **Big Idea #1:** I can identify the important variables represented in data.
      - *Essential Question #1: What is the appropriate way to communicate data?*
      - *Essential Question #2: What are the different types of data and how are they identified?*
    - **Big Idea #2:** I can display, describe, and summarize different types of data.
      - *Essential Question #1: What are the numerical and graphical methods for data representation?*
      - *Essential Question #2: Which are the best graphical displays to use for the different types of data?*
      - *Essential Question #3: Which are the best graphical displays to use for comparing data sets?*
    - **Big Idea #3:** I can understand standard deviation and its uses.
      - *Essential Question #1: What is standard deviation and how is it represented numerically?*
      - *Essential Question #2: How does standardizing affect the distribution of a variable?*
  - Unit II Title: Exploring Relationships Between Data
    - **Big Idea #1:** I can discover, interpret, and create scatterplots.
      - *Essential Question #1: How are patterns in scatterplot determined and represented?*
      - *Essential Question #2: What does correlation reveal about scatterplots?*

- *Essential Question #3: How does causation effect the interpretation of a scatterplot?*
  - **Big Idea #2:** I can interpret scatterplots using linear models.
    - *Essential Question #1: How does a linear equation summarize the relationship between two variables?*
    - *Essential Question #2: How is the best linear model for a set of data determined?*
    - *Essential Question #3: Why is it important to evaluate the residuals of a linear model?*
  - **Big Idea #3:** I can understand the functions of regression analysis.
    - *Essential Question #1: What constitutes a set of data as suitable or unsuitable for Regression Analysis?*
    - *Essential Question #2: Can a regression be misleading?*
    - *Essential Question #3: What are the properties of a linear regression model?*
    - *Essential Question #4: When is re-expression useful?*
- <u>2nd Quarter</u>
  - <u>Unit III Title: Gathering Data</u>
    - **Big Idea #1:** I can understand randomness.
      - *Essential Question #1: What does it mean for an outcome to be random?*
      - *Essential Question #2: Why are running simulations useful in statistics?*
      - *Essential Question #3: Why is the description of a simulation important?*
    - **Big Idea #2:** I can use sample surveys to make predictions about populations.
      - *Essential Question #1: How are successful samples of a population taken?*
      - *Essential Question #2: Why is identifying bias important in statistics and how is it determined?*
      - *Essential Question #3: What should be described in a statistical analysis of a sample?*
    - **Big Idea #3:** I can make inferences and justify conclusions from experiments and observational studies.
      - *Essential Question #1: What is an observational study and how are they identified?*
      - *Essential Question #2: What is the purpose of an experiment?*

- *Essential Question #3: How are the main types of experiments used and administered?*
  - o Unit IV Title: Randomness and Probability
    - **Big Idea #1:** I can recognize random phenomena and determine their probability.
      - *Essential Question #1: What are random phenomena and how are they identified?*
      - *Essential Question #2: What does it mean for events to be disjointed or independent?*
      - *Essential Question #3: What are the simple rules of probability and their uses?*
    - **Big Idea #2:** I can use the general rules of probability to identify conditional probabilities and independent events.
      - *Essential Question #1: When should the General Addition Rule and the General Multiplication Rule be applied?*
      - *Essential Question #2: What are conditional probability and reverse conditioning?*
      - *Essential Question #3: Can graphic organizers be beneficial when determining probability?*
      - *Essential Question #4: What is independence, and why is it important?*
    - **Big Idea #3:** I can identify and use random variables.
      - *Essential Question #1: What is a Random Variable?*
      - *Essential Question #2: How is the probability model for discrete random variables found?*
      - *Essential Question #3: What does it mean when asked to find the mean or variance of a random variable?*
    - **Big Idea #4:** Using probability models to determine possible outcomes for random variables.
      - *Essential Question #1: How does one identify a Binomial or Geometric Variable?*
      - *Essential Question #2: How are geometric and binomial probabilities found?*

- <u>MID-TERM EXAM</u>

- <u>3rd Quarter</u>
  - o Unit V Title: Proportions
    - **Big Idea #1:** I can understand and use the sample distribution model.
      - *Essential Question #1: What is a sample distribution?*
      - *Essential Question #2: How does sample size effect the distribution of means?*

- *Essential Question #3: What is the impact of the Central Limit Theorem?*
- *Essential Questions #4: How does one model the distribution of sample proportions?*
  - **Big Idea #2:** I can explore confidence intervals and describe how they apply to the world.
    - *Essential Question #1: What is a confidence interval?*
    - *Essential Question #2: How do confidence intervals relate to the world?*
    - *Essential Question #3: Why is the margin of error and sample size significant in understanding a confidence interval?*
  - **Big Idea #3:** I can test hypotheses about proportions.
    - *Essential Question #1: Why are hypotheses tested about proportions?*
    - *Essential Question #2: What is the P-value and its purpose in hypothesis testing?*
    - *Essential Question #3: How are hypotheses tests and confidence intervals related?*
    - *Essential Question #4: How do errors affect hypotheses testing?*
  - **Big Idea #4:** I can compare two proportions using sample distributions, confidence intervals, and hypotheses testing.
    - *Essential Question #1: Why are sample distributions used when comparing two proportions?*
    - *Essential Question #2: What do confidence intervals reveal about the data when used for comparing two proportions?*
    - *Essential Question #3: When are hypotheses tests used to comparing two proportions?*
- **Unit VI Title: Means**
  - **Big Idea #1:** I can understanding how confidence intervals and hypotheses tests relate to means.
    - *Essential Question #1: What does it mean to make an inference?*
    - *Essential Question #2: How is a confidence interval for means interpreted correctly?*
    - *Essential Question #3: What are the t-models and how are they used?*
  - **Big Idea #2:** I can compare the means of two groups of data.
    - *Essential Question #1: How are t-models used to compare the means of two data sets?*
    - *Essential Question #2: What is pooling?*

- *Essential Question #3: What are the conditions for inference in a t-test model and why are they important?*
- *Essential Question #4: How does a Pooled-t method affect the comparison of two means?*
  - **Big Idea #3:** I can examine and interpret paired data sets.
    - *Essential Question #1: What is paired data?*
    - *Essential Question #2: What are the similarities of paired t-methods and other t-methods?*
    - *Essential Question #3: When is blocking used to compare paired data?*
- **4th Quarter**
  - **Unit VII Title: Inference When Variables are Related**
    - **Big Idea #1:** I can compare a counted data set with multiple hypotheses.
      - *Essential Question #1: What are the Chi-square model and Chi-square statistic?*
      - *Essential Question #2: What are the conditions for inference in a chi-squared model and why are they important*
      - *Essential Questions #3: How are hypotheses about categorical variables tested?*
      - *Essential Question #4: What do the chi-square models tell you about the data being tested?*
    - **Big Idea #2:** I can make inferences about the regression for sets of data.
      - *Essential Question #1: What is regression inference?*
      - *Essential Question #2: What are the conditions for inference in a regression and why are they important?*
      - *Essential Question #3: What does the confidence interval for a regression reveal about the data?*
  - **Unit VIII Title: Review for AP Exam/End of Year Project**
    - **Big Idea #1:** I can review, recall, and apply the Big Ideas from the 7 units above.
      - *Essential Question #1: What are all the skills from unit one and how are they applied?*
      - *Essential Question #2: What are all the skills from unit two and how are they applied?*
      - *Essential Question #3: What are all the skills from unit three and how are they applied?*
      - *Essential Question #4: What are all the skills from unit four and how are they applied?*
      - *Essential Question #5: What are all the skills from unit five and how are they applied?*

- *Essential Question #6: What are all the skills from unit six and how are they applied?*
- *Essential Question #7: What are all the skills from unit seven and how are they applied?*

- <u>**END OF COURSE EXAM**</u>

<u>Course Materials:</u>
- Google Chromebook
- Graphing Calculator

<u>Textbook</u>:
> Bock, D., Velleman, P., & De Veaux, R. (2010). *Stats Modeling the World* (3 ed.). Boston, MA: Addison-Wesley.

<u>Supplemental Textbook(s)</u>:
> D'Alessio, Michael. *AP Statistics: Crash Course.* Piscataway, NJ: Research & Education Association, 2011. Print.
> Hinders, Duane C., and William B. Craine. *AP Statistics 2016.* New York: McGraw-Hill Education, 2015. Print.
> Sternstein, MArtin, Ph.D. *AP Statistics.* 8th ed. Hauppauge: Barron's Educational Series, 2015. Print.

<u>Electronic Resources</u>:
- TI-84 Preferred
- Google Classroom
- Google Documents
- DocHub
- Google Sheets
- Google Forms
- http://www.rossmanchance.com/applets/

<u>Course Expectations:</u>
<u>Rules:</u>
1. Be <u>**RESPECTFUL**</u> at all times.
2. Employ the <u>**4P's**</u> every day.
   a. Be <u>**PROMPT**</u>!
   b. Be <u>**PREPARED**</u>!
   c. Be <u>**POSITIVE**</u>!
   d. <u>**PARTICIPATE**</u>!
3. Work from <u>**BELL TO BELL**</u>.
4. 3 Before Me!
5. Be <u>**HONEST**</u>!
6. <u>**NEVER GIVE UP**</u>!

<u>Procedures</u>:

    <u>Entering the Classroom</u>:
1. Enter **<u>quietly</u>**, grab your assigned calculator, and sit down in your assigned seat.
2. Get out your Chromebook, notebook, pencil, and homework (if assigned) and start on your Bell Ringer (**BR**) up on the SMART Board.
3. You may quietly talk to the person next you <u>UNTIL THE TARDY BELL RINGS</u>!
4. Once finished with your **BR** wait quietly in your seat for us to go over it together.
5. <u>**BR's are collected at the end of each week so make sure you keep them on a document separate from all other work and each *day* is clearly dated.**</u>

<u>Heading your papers</u>:
- Top Left of the paper Put the assignment.
- Top Right place your First and Last Name and the Date assigned.
- Ex. If assigned Pg. 345 # 4-30 Even
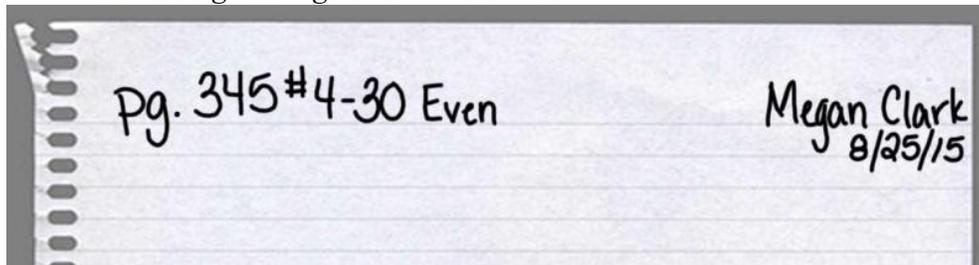
<u>Turning in Homework and Assignments</u>:
1. Look to make sure you headed the paper correctly.
2. You will be asked to place all assignments in the appropriate colored folder on the white shelf by the door.
   a. 1st Period: Orange
   b. 2nd Period: Green
   c. 4th Period: Blue
   d. 5th Period: Gray
   e. 6th Period: Purple
   f. 7th Period: Red
3. More than one page:
   1) Students need to make sure their name is on all pages.
   2) Students are to quietly get up and go to the teacher's desk.
   3) They are to staple all the pages together in the correct order.
   4) Then they are to hand the paper to the student sitting in the front row closest to the teacher's desk.

<u>Taking Notes</u>:

Students are to have paper and a pencil and a Chromebook with them and take notes. There is no order notes must be in, but I do require and check that you are taking them. Sometimes notes will be collected or looked at for a grade, so make sure they are being taken.

Pencil Sharpening:
- Students can quietly get up one at a time to sharpen their pencil at anytime, unless if testing, and sit back down without bugging or talking to anyone else. **If testing the student needs to ask for permission first.**
- If the teacher or anyone else is up talking:
    - Student needs to walk to the back of the classroom and around by the computers up to the electric sharpener by on the white shelf, and take the same trip back. This way you are not distracting others by crossing in front of the board or the person talking.

Getting a Tissue:
- Students can quietly get up one at a time to grab a tissue at anytime, unless if testing, and sit back down without bugging or talking to anyone else. **If testing the student needs to ask for permission first.**
- The same procedure for pencil sharpening is in place for tissues. Please walk along the back of the classroom.
- There is a trash can beside my desk so students do not need to walk all the way across the room to throw their tissues away.
- **USE HAND SANITIZER AFTER BLOWING YOUR NOSE!** We don't want your germs, and I will call you out in class and make you go back and use it.

Tests and Quizzes:
1. Students will have until the bell rings to quickly review.
2. Once the tardy bell rings, students will need to clear their desks of everything but a blank scrap piece of their Chromebooks (if applicable), paper, their assigned calculator, and a pencil. All other things need to be placed at the front of the room and this includes cell phones! NO CELL PHONES are permitted on your person while testing.
3. **There is to be no talking at all!** Unless the teacher has given permission to do so, for instance if you have raised your hand to ask a question. All other talking will be considered cheating and will result in the test being taken and the student given an F.
4. Once finished with the test they are to put their test/quiz in their class's folder.

5. <u>No electronic devices except for the calculator and Chromebook will be permitted during a test!</u> If seen it will be considered cheating and the test or quiz will be taken from the student and they will be given an F.

6. <u>Making up a test or quiz is the student's responsibility!</u> **If they are absent on the day of a test or quiz the student is to come to Miss. Clark either at the very beginning or very end of class to setup a time to take it.** <u>I will not chase down students to take tests!</u> **If they forget to make it up they will receive an F for the Test or Quiz!**

<u>Electronic Devices:</u>
1. Students will be required to have their electronic devices, cell phones, iPods, mp3 players, and etc., in the slot given to them by the door.
2. Students will only be allowed to use them when instructed for class use.

<u>Late/ Missing/Makeup Work:</u>
Students are to place all late, missing, or makeup work in their period folder **Students are responsible for finding out what work they missed. I will tell them, but only if asked!** They will also be able to find missing work on the Google Classroom and Progress Book.

<u>Graded Assignments:</u>
With the exception of test and quizzes all graded assignments will be placed in the student's period Crate, crates are under the assignment board. Students will be given the opportunity to go over and get their graded assignments during any free time they have in class. This box will be cleared out and papers will be trash after every interim report and nine weeks, approximately every 4.5 weeks.

All tests and quizzes will be passed back out by Miss. Clark, once all students have finished or made up the test or quiz. Tests and quizzes will not be passed back until that time.

<u>Books:</u>
Students assigned a book. Books will be kept in their subject's cabinet in my room. They will be able to use the online book for homework and any work outside of the classroom. If in a class they do not have an online book they will be permitted to take their book home with them every day.

<u>For classes without an online book if a student does decide to leave their books in my room they are still responsible for it! So if it gets lost or damaged while in my room it is not my responsibility to replace it, it is that student's and his or her guardian's responsibility. So, store at your own risk!</u>

<u>Grading</u>:

Unit Exams	50%
Assessments (Including: Quizzes, Essays, Labs, and Projects)	30%
Class work/Homework	20%

- Each nine week's grade comprises 20% of a student's final grade.
- The Mid-Term Exam and End of Course Exam each comprise 10% of a student's final grade.

<u>Grading Scale:</u>
The grading scale for Chillicothe High School can be found in the student handbook or online at
http://www.chillicothe.k12.oh.us/1/Content2/studenthandboook.

<u>Late Work:</u> Late work will be subject to the Board-adopted policy on assignments that are submitted late (to be reviewed in class).
- Regardless of the absence type (excused, unexcused, OSS, etc.), students are expected to make up work and be held accountable for learning all material they missed.
- Any student who is absent from school will receive one (1) additional day for every day he/she missed to make up his/her work for full credit (100%).
- Any student who exceeds the allotted time to turn in an assignment for full credit may still submit work late for partial credit.
  - Any student who turns in work up to 1 week late must at least be given the opportunity to earn 75% on that assignment.
  - Any student who turns in work between 1 and 2 weeks late must at least be given the opportunity to earn 60% on that assignment.
- The end of the 9 weeks is the cut off point for teachers to accept late work from students for full or partial credit unless the teacher decides to give the student an incomplete for the 9 weeks due to extenuating circumstances.

<u>Performance Based Section: Writing Assignments/Exams/Presentations/Technology</u>
One or more of the End of Unit Exams may be Performance Based. According to the Ohio Department of Education, "Performance Based Assessments (PBA) provides authentic ways for students to demonstrate and apply their understanding of the content and skills within the standards. The performance based assessments will provide formative and summative information to inform instructional decision-making and help students move forward on their trajectory of learning." Some examples of Performance Based Assessments include but are not limited to portfolios, experiments, group projects, demonstrations, essays, and presentations.

<u>Projects:</u>

Bias Survey: You and your partner(s) will design and conduct an experiment to investigate the effects of response bias in surveys. You may choose the topic for your surveys, but you must design your experiment so that it can answer at least one of the following questions: (Not every group will be permitted to investigate the same question.)
- o Can the wording of a question create response bias?
- o Do the characteristics of the interviewer create response bias?
- o Does anonymity change the responses to sensitive questions?
- o Does manipulating the answer choices change the response?

Proposal (20 points):
- The proposal is due: _____. Late work will be penalized 20% per day, even if you are absent.
- The proposal will be worth 20% of the grade, so don't treat it casually.
- If the proposal isn't approved the first time, you will need to resubmit it for a reduced grade. You must attach the original proposal to any resubmissions.
- **In your proposal, you should:**
  - o Describe your topic and state which type of bias you are investigating.
  - o Describe how you will obtain your subjects (minimum sample size is 50). This must be practical!! Your population does not need to be from this school nor should you interrupt any classes.
  - o Describe what your questions will be and how they will be asked, including how you will incorporate the principles of a good experiment and avoid confounding variables. Convince me that you have a good design!

Poster (70 points):
- The poster is due: _____. Late work will be penalized 20% per day, even if you are absent.
- The key to a good statistical poster is communication and organization. Make sure all components of the poster are focused on answering the question of interest.
- The poster should be standard sized and not on foam board. Make sure the poster is light enough to be hung on the wall.
- **The poster should include:**
  - o Title: Should be in the form of a question.
  - o Introduction: In the introduction you should discuss what question you are trying to answer, why you chose this topic, and what are your hypotheses.

- o Data Collection: In this section you will describe how you obtained your data. Be specific.
- o Graphs and Summary Statistics: Make sure the graphs are well labeled, easy to compare, and help answer the question of interest.
- o Discussion and Conclusions: In this section, you will state your conclusions. You should also discuss any errors you made, what you could do to improve the study next time, etc.
- o Live action pictures of your data collection in progress.

- **Presentation(10 points):**
  - o Each pair (or individual) will be required to give a 5 minute oral presentation to the class. Both members need to participate equally and should be prepared to answer questions.

Points Possible	Points Earned	Rubric for Statistics Projects
20		**Proposal:**
5		Stated the topic being investigated.
5		Clearly described the type of bias being investigated.
5		Clearly described how the sample will be obtained.
5		Clearly described the methods of the experiment and how it will be conducted.
8		**Introduction/Title:**
2		Title is clear and in the form of a question.
3		Introduction clearly describes the question that is being investigated.
3		Introduction clearly states the hypotheses for the question of interest.
15		**Data Collection:**
4		The method of data collection is clearly described
4		The method of data collection includes appropriate randomization
4		The method of data collection includes measures to reduce bias/confounding/variability

3		The quantity of data collected is appropriate
15		**Graphs and Summary Statistics:**
3		Appropriate graphs are used (help answer the overall question of interest)
3		Graphs are accurate and neat
3		Graphs are easy to compare (same scale, colors, etc.)
3		Appropriate summary statistics are calculated (help answer the overall question of interest)
3		Summary statistics are calculated correctly (raw data is included)
16		**Discussion and Conclusions:**
4		Conclusion clearly and correctly addresses the question of interest
4		Conclusion is supported by the appropriate inferential procedure
4		Appropriate generalizations are made with supporting evidence
4		Shortcomings and/or suggestions for improvement are discussed
16		**Overall Impression:**
3		Includes live action pictures of data collection (At least 3)
3		Poster is organized to answer the question of interest
5		Poster is visually appealing and shows effort
5		Question of interest is non-trivial and well-formed
10		**Oral Presentation:**
4		Presentation is well organized
4		Presentation is thorough
2		Questions are handled appropriately

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After you have reviewed the preceding packet of information with your parent(s) or guardian(s), please sign this sheet and return it to me so that I can verify you understand what I expect out of each and every one of my students.

Student Name (please print):

_____

Student Signature:

_____

Parent/Guardian Name (please print):

_____

Parent/Guardian Signature:

_____

Date: _____