AP Statistics
Summer 2019 Assignment – *due the first day of school*

I am very pleased you have chosen to take AP Statistics next year! I suspect you'll enjoy the course, and learn entirely new ways to think about numbers and data. Statistics is the study of data (as opposed to probability, which is the study of odds and likelihoods – we'll study both). We'll spend the year analyzing data, designing experiments and surveys, calculating probabilities, and testing outcomes.

The AP Statistics exam has been around since 1997 (among AP courses, this makes it relatively young). The 2019-2020 school year will be the first revision to the course the college board has made since the course's inception. Long story short, I am prepared for these changes. The course is about 5% longer than previously, though also a bit streamlined. If you have siblings who took the course, next year will be slightly different (hopefully even better) – and perhaps a little bit more intense, in order to get through everything by early May.

Summer work in AP courses is simply a necessity. We start the school year so very late compared to most other schools in the country, and we need to complete the curriculum in time for the AP exam. This assignment is meant to be painless. However, it is absolutely required. You will earn your first grade of the year with the quality completion and submission of this assignment on the first day of school.

A calculator can be used for the probability portion of this assignment (the final part). You will be required to have a graphing calculator every day, at every class. There is no portion of this course during which you are not permitted to use your calculator. Unlike other math classes, you may use a graphing calculator on every exam, every quiz, and on the entirety of the AP exam. Come to school on day #1 with a graphing calculator. If you have calculator questions, just write me an e-mail.

The assignment has **four** sections:

1) One of the best and most entertaining books about *conditional probability* is <u>Bringing Down the House: The Inside Story of Six M.I.T. Students Who Took Vegas for Millions,</u> by Ben Mezrich. You will READ the book and write a **very** **brief** essay. **One page, typed, 12-point typeface** (there is more writing in AP Statistics than in any other math class, by the way).

> **Using SPECIFIC examples from the book, explain how the blackjack teams leveraged CONDITIONAL probability to make money playing blackjack. Though they did not always win, how is it they were consistently profitable?**

Remember, your essay should include <u>specific examples</u> from the book. I am very good at identifying essays written by people who haven't actually read the book. I recommend reading Kevin's essay at the back of the book, which will help you with the question. YOU WILL LOVE THIS BOOK…trust me!

Here's a link to the book at Barnes & Noble. I assure you they have it in stock online and at the store.

http://www.barnesandnoble.com/w/bringing-down-the-house-ben-mezrich/1103440011?ean=9780743249997

2) You will watch SIX videos. Be prepared to talk about them the first day of school. Links to the videos are found on my teacher webpage or below. They are less than an hour in total.
   a. Go to hvrsd.org
   b. Under STAFF – click on staff directory.
   c. Type in Mr. Shrager's name.
   d. Click on the link for my website.
   e. Click on AP STATISTICS and get the video link

Or get them here:

Summer 2019 AP Statistics Videos to watch…

Arthur Benjamin: Teach statistics before calculus!
http://www.youtube.com/watch?v=BhMKmovNjvc&list=PL6D412F07E66207FF&index=9

Hans Rosling's 200 Countries, 200 Years, 4 Minutes - The Joy of Stats - BBC Four
http://www.youtube.com/watch?v=jbkSRLYSojo&list=PL6D412F07E66207FF&index=10

Hans Rosling: Religions and babies
http://www.youtube.com/watch?v=ezVk1ahRF78&list=PL6D412F07E66207FF&index=11

The Strange Powers of the Placebo Effect
https://www.youtube.com/watch?v=yfRVCaA5o18

Secrets to measuring a piece of paper. (this is important for the discussion of conditions)
https://www.youtube.com/watch?v=9yUZTTLpDtk&t=3s

What if Barry Bonds had played without a bat? (this is important for the discussion of simulation. Fun video even if you don't like sports).
https://www.youtube.com/watch?v=JwMfT2cZGHg&t=298s

There are many more entertaining statistics videos that you can find on my youtube channel: www.youtube.com/MrAPStatistics. We'll watch quite a few of these videos throughout the school year.

3) Read this article from the fivethirtyeight.com website: <u>Humans Are Dumb at Figuring Out How Smart Animals Are</u> https://fivethirtyeight.com/features/humans-are-dumb-at-figuring-out-how-smart-animals-are/ (this is an awesome website, by the way, filled with data-driven news and analysis. I highly recommend it).

The essence of this article is about collecting data and analyzing and interpreting the intelligence of animals. No matter how you think about the politics or the ethics of this (let's assume that the animals being tested are actually quite well-cared for), consider this:

WHAT is being studied? SPECIFICALLY how would <u>you</u> test it? Write a paragraph or two explaining how you might create an experiment (a humane experiment) to test comparative intelligence in non-human animals. For example, would you create a "maze" task, or a "food behind the door task." Think about and answer…

- How many animals would you test of each species? Can you test them all?
- Will all animals perform exactly the same on each task, for example, will all blue jays pick the correct door the same number of times? Why or why not?
- Is it worth comparing animal intelligence in this way? Should we pursue some other path to assess intelligence.

4) Complete the following **ten** probability problems. Unlike the other parts of this assignment, you are **NOT supposed to get most (or ANY) of these correct**. Simply try your best and DO NOT do any research or look up any formulas. I suspect that most of you will get **three or fewer** of these right. Even if you get none of them correct, that's okay. Just try (and show work where applicable). Do all work and write all answers on the attached answer sheet. I need to give you a pre-assessment for a topic we will learn this year. This is that pre-assessment (and we'll spend the entire second marking period on probability).

a) What is the probability of flipping a fair coin 10 times in a row and getting heads all ten times (you can leave an exponent in your answer, or use scientific notation).

b) What is the probability of randomly selecting 3 cards from a standard 52-card deck of cards, without replacement, and having all three cards be "nines."

c) The probability that I randomly select a female from one of my 2013-2014 AP Stats classes is 27/64. The probability that I randomly select somebody wearing glasses is 17/64. The probability that I randomly select a girl wearing glasses is 9/64. If I select a student at random, what is the probability that the student is either a girl or is wearing glasses?

d) Missiles fired from a rocket launcher are independent of one another. Given that we have a 30% probability that any given missile hits an extremely distant target, if seven missiles are fired, what is the probability that AT LEAST ONE of them hits the distant target?

e) Missiles fired from a rocket launcher are independent of one another. Given that we have a 30% probability that any given missile hits an extremely distant target, if seven missiles are fired, what is the probability that THREE OR MORE of them hits the distant target?

f) The probability that a randomly selected student in the cafeteria has purchased pizza is 0.30. The probability that a randomly selected student has purchased ice cream is 0.35. The probability that a randomly selected student has purchased both pizza and ice cream is 0.05. We selected a student and find that he has purchased pizza. What is the probability that he has also purchased ice cream?

g) Christina is late to class 35% of the time. She has an iced coffee with her in class 40% of the time. She is late and has an iced coffee with her 25% of the time. Assuming that her behavior with regard to these matters is independent day-to-day, what is the probability that on a randomly selected day Christina is either late to class or has an iced coffee (or both?).

h) A college will offer free applications (they will waive the application fee) for all applicants who score in the top 8% of the SAT verbal section. Assume the mean SAT verbal score is 500 with a standard deviation of 100, what is the cut-off score for the application fee waiver? (although SAT scores end with a zero, your answer shouldn't necessarily)

i) An incipient form of cancer occurs in three out of every 1000 Americans. To provide early detection, a screening test has been developed that rarely errs. Among healthy patients, only 5% get a + reaction (false alarm). Among patients with this incipient cancer, only 2% get a – reaction (missed alarm).

If this test is used to screen the American public, all those who get a + reaction will be hospitalized for exploratory surgery. What proportion of these people, who are thought to have cancer, will *actually* have cancer?

j) The Giants score an average of 37 points per game with a standard deviation of 9 points. The Ravens score an average of 31 points per game with a standard deviation of 6 points. Assuming that the scores for each team are normally distributed, and that no other factors matter (like defensive matchups or injuries), on any randomly selected day when these two teams are playing each other, what is the probability that the Ravens beat the Giants?.

ANSWERS: SPACE TO SHOW WORK (you may attach extra paper)

a)_____

b)_____

c)_____

d)_____

e)_____

f)_____

g)_____

h)_____

i)_____

j)_____