AP Statistics
Ms. McIlroy

This course will be unlike any other math class you have ever taken! Learning statistics is like learning a new language. There are new ideas, new vocabulary, and new rules. The pace of this course is moderate but relentless, so it is essential that you do not fall behind. To get the most out of this course you need to be competent in basic algebra, be familiar with basic statistical measures, understand how to use a graphing calculator, and, most importantly, be willing to clearly and completely explain your answers in context. There is no better way to learn statistics than to tackle problems in the text, working examples, and wrestling with the exercises.

Although this is a math course, AP Statistics concentrates much more heavily on thinking, reasoning, writing, and communicating than it does on number-crunching. Graphing calculators and computer software programs will do most of the tedious "busy work" for you.

My goal is for you to be able to enjoy your summer and to come back rejuvenated; ready to embrace the work for the year. Relax and find opportunities to rest this summer, but don't wait until the last minute before school to start your summer work. I will check my school email periodically throughout the summer if you have questions. I can be reached at hmcilroy@masterschool.org.

I am looking forward to a great year!

Sincerely,

Heather McIlroy

Summer Assignment

You will need to complete the following five items this summer:

1. There is a Schoology course which you must join. Some assignments will be turned in here as well and vital information will be posted here for you.
   a. Schoology: www.schoology.com
      i. Sign up as a student and use the following code to join the AP Statistics Course: **BK79-V5QB-9HT6S**

2. Buy, rent, borrow, or acquire in some way a TI-84 graphing calculator.

3. Exploring Data: Basic Statistical Analysis
   a. Watch - What Is Statistics: Crash Course Statistics #1: https://www.youtube.com/watch?v=sxQaBpKfDRk
   b. Please fill in the worksheet below to the best of your ability. This is for me to better understand what you all already know.

4. Understanding sampling methods and sampling bias:
   a. Use these sources below to help you fill in the brief study guide and answer the following worksheets. This will help us get a jump start to the school year.
      i. Sampling Methods and Bias with Surveys
      ii. Census, Nonresponse, and Undercoverage
      iii. Types of Sampling Methods
      iv. Sampling: Simple Random, Convenience, systematic, cluster, stratified - Statistics Help
      v. https://www.khanacademy.org/math/statistics-probability/designing-studies/sampling-methods-stats/a/sampling-methods-review
      vi. https://www.khanacademy.org/math/ap-statistics/gathering-data-ap/sampling-observational-studies/v/examples-of-bias-in-surveys

5. The beauty of statistics is that it is all around us. We see examples of good and bad stats every single day in newspapers and magazines, on newscasts and at sporting events and on a host of web sites--especially those dealing with politics, the economy and the government. To really see how statistics impacts our lives, a part of your summer assignment is to develop a Real World Statistics Portfolio.

   Collect newspaper, magazine, video or internet articles/stories/advertisements that include real-time statistical concepts--both good and bad. These may include things like graphs, charts or tables. They may also report conclusions

made as a result of looking at data—e.g., newspaper/internet reports on drug/social/psychology studies.

For each portfolio item, highlight the statistics mentioned and answer the following questions:

1. What is the source of the data? When and where was it published?
2. What was the purpose of the article/statistic/data? Why was it written/produced?
3. Were any conclusions stated? If so, what were they?
4. Is the article/statistics/data convincing? Do you believe the stated results? Explain.

You must have 3 articles each from a different source. Each article must be current—that is, it must have appeared in the news from 6/1/19-9/1/19.

Good resources for statistics articles/charts include:

- The New York Times (https://www.nytimes.com/)
- The Washington Post (https://www.washingtonpost.com/)
- Huffington Post (http://www.huffingtonpost.com/)
- Significance Magazine (http://www.significancemagazine.org/view/index.html)
- The Wall Street Journal's Numbers Guy (http://blogs.wsj.com/numbersguy/)
- BBC News Interactives and Graphics (http://www.bbc.co.uk/news/11628973)
- Freakonomics (http://www.freakonomics.com/)

6. If you have the time and want to delve a little further into the world of statistics, try out one or more of the following resources. ***These are not required at all***.

Books:

- **Freakonomics: A Rogue Economist Explores the Hidden Side of Everything** by Levitt and Dubner
- **The Drunkard's Walk, How Randomness Rules Our Lives** by Leonard Mlodinow
- **Predictably Irrational** by Dan Ariely
- **Damned Lies and Statistics: Untangling Numbers from the Media, Politicians, and Activists**, J. Best, University of California Press, 2001.
- **A Mathematician Reads the Newspaper**, J. A. Paulos, Basic Books, 1995.
- **200% of Nothing**, A. K. Dewdney, John Wiley and Sons, 1993.

- **Bringing Down the House: How Six Students Took Vegas for Millions**, B. Mezrich, Free Press, 2002
- **Moneyball: The Art of Winning an Unfair Game**, M. Lewis, Norton, 2003
- **Tainted Truth: The Manipulation of Fact In America**, C. Crossen
- **The Ghost Map: The Story of London's Most Terrifying Epidemic—and How It Changed Science, Cities, and the Modern World**, S. Johnson
- **The Tipping Point: How Little Things Can Make a Big Difference**, M. Gladwell, Little, Brown & Co., 2002

Videos (TED Talks):

- Surprising Stats about Child Car Seats:
  - http://www.ted.com/talks/steven_levitt_on_child_carseats
- What We Learned from 5,000,000 Books:
  - http://www.ted.com/talks/what_we_learned_from_5_million_books
  - Use the Google NGram Viewer to understand how our culture has changed over time. https://books.google.com/ngrams
- How Juries are Fooled by Statistics:
  - http://www.ted.com/talks/peter_donnelly_shows_how_stats_fool_juries
- Why Smart Statistics are the Key to Fighting Crime:
  - http://www.ted.com/talks/anne_milgram_why_smart_statistics_are_the_key_to_fighting_crime
- Does Racism Affect How You Vote?:
  - http://www.ted.com/talks/nate_silver_on_race_and_politics
- Flip Your Thinking About AIDS in Africa:
  - http://www.ted.com/talks/emily_oster_flips_our_thnking_on_aids_in_africa
- Three Ways to Spot a Bad Statistic:
  - https://www.ted.com/talks/mona_chalabi_3_ways_to_spot_a_bad_statistic

Part 3: Exploring Data - Basic Statistical Analysis

Describe each term to the best of your ability and give examples.

What is Statistics??

Data Analysis:

Categorical Variable:

Quantitative Variable:

Marginal Distribution vs. Categorical Distribution:

Describe a distribution (SOCS!!)

SHAPE   OUTLIER   CENTER   SPREAD

5 number summary:

Outlier rules:

Measures of Center and Spread: Which measures are the best? Resistant vs Non-resistant?

Standard Deviation:

Draw an example and explain the pros and cons– Don't forget a title and labels!

Bar Graph:

Pie Chart:

Dot Plots:

Stemplots:

Histogram:

Part 4: Sampling & Survey Study Guide

Please complete the study guide to the best of your ability. Most, if not all, of the answers should be found on the videos. If not, look it up online.

Population: a _____ of objects or people

Sample: a _____ of the population

Random Sample: when each member of the population has the _____ of being selected

Biased Question: a question that makes an unjustified _____ or makes some answers appear better than others.

Identifying Representative Samples

1. You survey customers at a mall. You want to know which stores they shop at most. Which sample is more likely to be more representative of the population? Why?
    a. You survey shoppers in a computer store.

    b. You walk around the mall and survey shoppers.

2. You survey a store's customers. You ask why they chose the store. Which sample is more likely to be more representative of the population? Why?
    a. You survey 20 people at the entrance from 5:00pm to 8:00pm.

    b. You survey 20 people at the entrance throughout the day.

3. You want to survey people about their favorite exercise. Which sample below is more likely to be more representative of the population? Why?
    a. You ask people on a jogging track in a park to name their favorite exercise.

    b. You ask people on their lunch hour at a downtown intersection to name their favorite exercise.

Identifying Biased Questions

4. Is each question biased or fair? If bias, what is causing the bias and in which direction is it biased?
    a. "Do you think that soothing classical music is more pleasing than the loud, obnoxious pop music that teenagers listen to?"

    b. "Which do you think is the most common age group of people who like pop music?"

    c. "Do you prefer classical music or pop music?"

    d. "Do you prefer greasy meat or healthy vegetables on your pizza?"

    e. "Which pizza topping do you like best?"

Identifying Sampling Methods

The main types of sampling methods are simple random sampling, stratified sampling, cluster sampling, multistage sampling, systematic random sampling, convenience sampling and voluntary response sampling. Please indicate which sampling method you believe is being used and explain your reasoning.

1. In order to estimate the percentage of defects in a recent manufacturing batch, a quality control manager at Intel selects every 8th chip that comes off the assembly line starting with the 3rd, until she obtains a sample of 140 chips.

2. In order to determine the average IQ of ninth-grade students, a school psychologist obtains a list of all schools in the local public school system. She randomly selects five of these schools and administers an IQ test to all ninth-grade students at the selected schools.

3. In an effort to determine customer satisfaction, United Airlines randomly selects 50 flights during a certain week and surveys all passengers on the flights.

4. A member of Congress wishes to determine her constituency's opinion regarding estate taxes. She divides her constituency into three income classes: low-income households, middle-income households, and upper-income households. She then takes a random sample of households from each income class.

5. In an effort to identify whether an advertising campaign has been effective, a marketing firm conducts a nationwide poll by randomly selecting individuals from a list of known users of the product.

6. A radio station asks its listeners to call in their opinion regarding the use of American forces in peacekeeping missions.

7. A farmer divides his orchard into 50 subsections, randomly selects 4 and samples all of the trees within the 4 subsections in order to approximate the yield of his orchard.

8. A school official divides the student population into five classes: freshman, sophomore, junior, senior, and graduate student. The official takes a random

sample from each class and asks the members' opinions regarding student services.

9. A survey regarding download time on a certain Web site is administered on the Internet by a market research firm to anyone who would like to take it.

10. A lobby has a list of 100 senators of the United States. In order to determine the Senate's position regarding farm subsidies, they decide to talk with every seventh senator on the list starting with the third.