**AP Stats Essential Questions**

**“…your success in life will be determined largely by your ability to speak, your   
ability to write, and the quality of your ideas…” - Patrick Winston**

Here are essential questions/prompts for each unit of AP Statistics (with some units combined). Notice that they do not have quick answers like "yes," "no," or "17." Rather, they are open-ended questions from which you should be able lead a discussion with correct vocabulary, covering all relevant concepts. At the end of each unit, you will meet 1-1 with Mr. Malan, he will randomly select two EQs and you will discuss them at length. Be ready to respond to follow-up questions involving examples or clarification. This assessment will count in the Exam category of your final grade.

**Unit 1**

1. Discuss the major pursuits of statistics.
2. How do graphs help us understand key features of data? Include quantitative and categorical data.
3. What are some effective non-graphical ways of summarizing data? Include quantitative and categorical data.
4. How and why do we standardize data values?
5. Discuss the importance and use of a normal model.

**Unit 2**

1. How can a scatterplot help us understand a bivariate set of data?
2. What are some of the benefits and dangers of using a regression model?
3. How can residuals help us better understand our model and our data?
4. Discuss the 3 classifications of bivariate outliers and be ready to draw an example of any of them.
5. Why and how do we sometimes re-express a set of data? After re-expressing bivariate data, how do we then use the resulting equation to make predictions?

**Unit 3**

1. Why and how do we use simulations?
2. In sampling, why is randomness important and how is it employed?
3. After we select a sample, what are some important considerations when conducting a survey?
4. Explain the 4 principals of experimental design.
5. To what degree can we generalize the results of a sample/survey, an observational study, and a randomized experiment? Answer all 3.

**Unit 4**

1. What is probability and what are some fundamental strategies to calculate it?
2. How and when do we use different diagrams to calculate probability?
3. Compare and contrast random variables (Ch 16+) with the more general probability outcomes of Ch 14-15.
4. Discuss and : How are they found, what do they tell us, and how can we interpret them graphically?
5. What are Bernoulli trials and how can they be "built up" into questions involving random variables?

**Unit 5 (likely included in Unit 4 or 6)**

1. Explain the Central Limit Theorem for means. Be sure to include the effect of increasing the sample size.

**Unit 6**

1. How do we find and use a confidence interval? (Explain the general steps; do not recite formulas.)
2. What are the conditions for inference for 1 proportion. Why are they necessary? (Must answer both.)
3. Describe the logical flow of a hypothesis test. You must include a description of what the -value represents.
4. Discuss , , power, how they relate to each other, and how they are affected by sample size.
5. How can we extend the 1-Prop Z-test procedure and formulas to compare two populations?

**Unit 7**

1. What are -distributions? When and how are they used?
2. What are the conditions for inference for 1 mean?
3. What is standard error? When do we use it?
4. Under what circumstances do we use a matched pairs test?
5. Describe the difference between the inference procedures for independent sample and the inference procedures for dependent samples. Here, I meant “inference for diff of 2 means” vs matched pairs inference. But 2022-2023 students interpreted as including 1sample t-tests.

**Unit 8-9 (In class, we will just call it “Unit 8”)**

1. How do we decide which chi-square test to use?
2. The formula for chi-square test statistic is . Explain in simple terms what each term indicates. What does a low chi-square value indicate? What does a high chi-square value indicate?
3. What is the typical null hypothesis for a linear regression test? What does it mean graphically and in plain words?
4. Discuss the equal variance condition (what it says, what it means, and how to check it on a graph).
5. Discuss the major pursuits of statistics. (This was omitted from unit 1 in 2022-2023.)

**Philosophy of EQs**

In real life, you will ***never*** be asked…

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Description automatically generated with medium confidence

…and be expected to answer with a simple letter[[1]](#footnote-1), thus showing your prowess and satisfying your interlocuter.

Rather, in your mid-thirties, you will be asked, “Are you worried about the new landfill? What do you think it’s doing to our local environment?” You will need/want to engage in intelligent conversation. All your book-study and your “5” on the test will be useless if they do not contribute toward you being able to engage intellectually and make wise decisions.

1. By the way, the answer is (B)  
   Source: AP Environmental Science Course and Exam Description, <https://apcentral.collegeboard.org/media/pdf/ap-environmental-science-course-and-exam-description.pdf>, p. 230 [↑](#footnote-ref-1)