2019 Advanced Placement Statistics Summer Work

Introduction

Welcome to the AP Statistics course at Trumbull High School (THS). The purpose of this course is to gain a deep understanding of foundational concepts in statistics, apply this understanding to the answering of research questions in a wide variety of research-oriented fields of study, and prepare you to take the AP Statistics Examination, which serves to satisfy collegiate requirements in statistics.

The content of this course is extensive and equivalent to that of a university course in statistics. The standards and expectations for students in this course will be equivalent to that of a university course in statistics as well. Therefore, it is expected and required that students will engage in independent learning and scholarship prior to, and throughout the duration of the course. The independent learning begins with your study of the first two chapters of the textbook during the summer. Each student is required to: 1.) Read the introductory chapters in their book, (2) Complete the "Reading Sheets," (3) Complete the assigned exercises/problems from the book, (4) Read the assigned papers from former students, and (4) Come to school prepared to discuss the material from the summer work. The "Reading Sheets" are intended to help you focus on the important material in the first two chapters and aid in note taking. The papers from former AP Statistics students will provide you with advice, tips, and an authentic perspective of what it is like to take the course.

Materials

This document/assignment will be posted to Google Classroom and to the THS Mathematics Department website. To complete the summer work, you will need our textbook: The Practice of Statistics 6th Edition, by Starnes and Tabor. The textbook will be available for you to pick up from me during the week of finals, or at the front office of THS after this week. You will also need a notebook, the Reading Sheets that follow, the papers from former AP Statistics students (which will also be posted to Google Classroom), and a graphing calculator. The graphing calculator will be used extensively throughout this course and on the AP Statistics Examination. You will absolutely "get your money's worth" from your graphing calculator this year. If you cannot afford a graphing calculator or cannot obtain one, please email me or the Chairperson of the Mathematics Department, Mrs. Kathleen Laird, as soon as possible. All of the resources for the course will be tailored to using versions of the Texas Instruments Graphing Calculator TI-84 (although a TI-83 will suffice for most of our work). Independent learning and research will be required of those who elect to use a TI-89, any of the TI-Nspire calculators, or any of the other graphing calculator brands (e.g. Casio, Sharp, etc.) to determine the equivalent commands of the TI-84.

Assignment Information

Exercises/Problems: Complete the following listed problems/exercises and check the answers to the odd-numbered problems in the back of the book. You may use technology (including your graphing calculator, Microsoft Excel, or any other statistical package you are familiar with) for any of the following problems. Developing proficiency with your calculator (and statistical technology in general) will be one of the most important aspects of this course. Moreover, developing proficiency with using the graphing calculator will be absolutely essential for success on the AP Statistics Examination.

Submission of Work: Upon completion of the following exercises/problems, you will submit an individual copy of your solutions on the first day of class. However, you may discuss ideas and work with your peers in this course on the summer work. Although throughout the year each student's grade will be earned on their own, we will be a team this year—a group of intellectuals in a community of learning. Note that Plagiarism of any kind will not be tolerated and your submitted work must be your own. That being written, group work and learning with your peers is encouraged and one of the best aspects of learning mathematics/statistics. As for the Reading Sheets, these will be checked for completion. The first week of class will consist of reviewing and detailing the information from the first two chapters. Therefore, students should expect a summative assessment of the summer work at the end of the first week of class.

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Google Classroom: As mentioned above, we will be learning as a community this year. Accordingly, we will share a Google Classroom account, of which everyone will be a member. Feel free to post ideas, questions, and discussions as well as interact with your peers in this course on the page. Remember: be professional when posting; keep the content specific to this course and the learning of statistics; and note that myself, the Chair of the THS Mathematics Department, and your parents/guardians will have access to the page as well.

Assignment #1:

Chapter 1: Data Analysis

Readings: Read and take notes on Chapter 1 (pages 2-83); and complete the "Reading Sheets" as you read to help you focus in on the main ideas and important information.

Exercises/ Problems: 1, 4, 10, 11, 12, 18, 25, 26, 39, 46, 47, 55, 60, 67, 70, 81, 85, 87, 92, 93, 101, 102, 111, 113, 116, 121—126.

Assignment #2:

Chapter 2: Modeling Distributions of Data

Readings: Read and take notes on Chapter 2 (pages 90-136); and complete the "Reading Sheets" as you read to help you focus in on the main ideas and important information.

Exercises/Problems: 1—4, 5, 13, 19, 28, 31, 33, 37, 38, 41, 43, 45, 46, 49, 55, 59, 67, 85—90.

Assignment #3

Readings: Several papers from former AP Statistics students will be posted to the Google Classroom account. The prompt given for these papers required students to reflect on their year and write a letter to future AP Statistics students providing perspective, suggestions, tips, and advice for succeeding in the course. Please read each of these papers and keep their sentiments in mind. You may even recognize some of your peers!

Final Remarks

I will be presenting at several conferences in the coming months, and therefore, I will not have access to email during the summer. However, I will do my best toward to respond to general questions regarding the course and summer work at the end of August.

I advise you not to leave all of this work until the last minute or you will feel overwhelmed. Practice the productive academic habits that will enable you to be successful in our AP course this year: Do the tasks over time with intentionality and you will be fine!

I look forward to meeting you all and having a very successful year! Have a wonderful summer!

Sincerely,

Mr. Darrow

Mathematics/Statistics Teacher
Trumbull High School
BDarrow@TrumbullPS.org

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Please use these **"Reading Sheets"** to help organize your thoughts as you read through chapters 1 and 2. In statistics, reading requires active engagement with the text. Answer/complete the following to better aid in your understanding of the material.

Statistical Thinking and Chapter 1: Organizing Data

Key Vocabulary:

- Individuals
- Variables
- Categorical variable
- Quantitative variable
- Distribution
- Dotplot
- Bargraph
- Range
- Spread

- Frequency
- Outlier
- Center
- Shape
- Skewed left
- Skewed right
- Symmetric
- Dot plot
- Histogram
- Stemplot
- Split stems

- Back-to-back stemplot
- Time plot
- Mean
- $\sum$
- $\bar{x}$
- Nonresistant
- Median
- Resistant
- Quartiles

- Q_1 and Q_3
- IQR
- Five-number summary
- Minimum
- Maximum
- Boxplot
- Modified boxplot
- Standard deviation
- Variance

Calculator Skills:

- sortA( )
- sum
- mean

- 1-Var Stats
- ZoomStat
- TRACE

- WINDOW

(**Record key ideas and your own notes while reading from relevant sections of the textbook**)

1. *Statistics* is …

2. *Data* are…

3. *Individuals* are…

4. A *variable* is…

5. When given a data set, the *key questions* to ask are:
   - *Who…*

   - *What…*

   - *Why…*

   - *When, where, how, and by whom…*

6. The difference between a *categorical variable* and a *quantitative variable*. (Given an example of each)

7. Define *distribution*.

8. What is a *side-by-side bar graph* best for?

9. What type of data is a *dotplot* used for?

10. When would it be better to use a *bar graph* instead of a *dotplot*?

11. What type of data are *pie charts* and *bar graphs* used for?

12. How do you make a *stemplot*?

13. When is a *back to back stemplot* useful?

14. When is it advantageous to split stems on a stemplot?

15. How is the stemplot of a distribution related to its histogram?

16. What is a *histogram*?

17. When is it better to use a histogram rather than a stemplot or dotplot?

18. What is meant by *frequency* in a histogram?

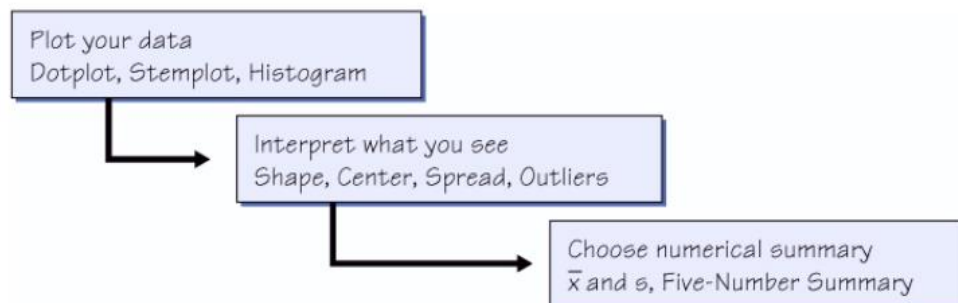19. What is the difference between a bar graph and a histogram?

20. When examining a distribution, you can describe the overall pattern by its

S_____ O_____ C_____ S_____

21. When setting the window for constructing a histogram on the TI-83/84+:
    a. What is the significance of Xscl?

    b. How do you choose the values of Xmin and Xmax?

    c. What is the significance of Ymax?

22. Define *outlier*.

23. If a distribution is *symmetric*, what does its histogram look like?

24. If a distribution is *skewed right*, what does its histogram look like?

25. If a distribution is *skewed left*, what does its histogram look like?

26. What is the difference between *cumulative frequency* and *relative frequency*?

27. What is an *ogive*?

28. When is it useful to construct a *time plot*?

29. In statistics, what is the most common measure of center?

30. Explain how to calculate the *mean*, $\bar{x}$.

31. Explain how to calculate the *median*, M.

32. Explain why the median is *resistant* to extreme observations, but the mean is *nonresistant*.

33. What is the difference between *"average" value* and *"typical" value*?

34. In statistics, what is meant by *spread*?

35. Explain how to calculate Q_1, Q_3, and IQR.

36. What is the *five-number summary*?

37. Describe a boxplot.

38. When does an observation become an *outlier*?

39. What does *standard deviation* measure?

40. What is the relationship between *variance* and *standard deviation*?

41. When does standard deviation equal zero?

42. Is standard deviation resistant or nonresistant to extreme observations? Explain.

43. Use a five number summary when…

44. Use $\bar{x}$ and *s* when…

45. How does multiplying data by a constant affect the mean, median, IQR and range of data?

46. How does adding a constant to data affect the mean, median, IQR and range of data?

47. The Data Analysis Toolbox (page 64) is designed to help you organize your thinking when investigating a statistical problem involving data sets.

    Summarize the Data Analysis Toolbox below:

Plot your data
Dotplot, Stemplot, Histogram

Interpret what you see
Shape, Center, Spread, Outliers

Choose numerical summary
$\bar{x}$ and s, Five-Number Summary

Chapter 2: Modeling Distributions of Data

Key Vocabulary:

- Density curve
- Mu (μ)
- Sigma (σ)
- Normal curve
- Normal distribution

- Inflection point
- 68-95-99.7 Rule
- Percentile
- N(μ , σ)
- Standardized value

- Z-scores
- Standard normal distribution
- Normal probability plot

Calculator Skills:

- Y[-.01, .02].01
- X{35, 185}25
- ShadeNorm(lowerbound, upperbound, μ , σ)
- Normalpdf(X, μ , σ)
- Normalcdf (lowerbound, upperbound, μ , σ)
- EE (1E99 and -1E99)
- invNorm(area, μ , σ)

1. Explain how to standardize a variable.

2. What is the purpose of standardizing a variable?

3. What is a percentile?

4. Is there a difference between the 80th percentile and the top 80%? Explain.

5. Is there a difference between the 80th percentile and the lower 80%? Explain.

6. What is a density curve?

7. What does the density curve represent?

8. Describe the shape of the normal density curve.

9. Where is the median of the normal density curve located?

10. Where is the mean of a density curve located?

11. What is a uniform distribution?

12. Where on the normal curve are the inflection points located?

13. Explain the 68-95-99.7 rule.

14. What is the standard normal distribution?

15. What information does the standard normal table give you?

16. How do you use the standard normal table (Table A) to find the area under the standard normal curve to the left of a given z-value? Draw a sketch.

17. How do you use the standard normal table (Table A) to find the area under the standard normal curve to the right of a given z-value? Draw a sketch.

18. How do you use the standard normal table (Table A) to find the area under the standard normal curve between two given z-values? Draw a sketch.

19. Describe two methods for assessing whether or not a distribution is approximately normal.

20. How can you produce a normal probability plot on the TI-83/TI-84+, and what should this look like if the data are normal?

21. What information needs to be used when using "ShadeNorm(" and what result will the calculator give?

22. What information needs to be used when using "Normalcdf(" and what result will the calculator give?

23. What information needs to be used when using "invNorm"and what result will the calculator give