

AP Statistics Final Review  
OPTIONAL Take-home  
V 2022

**DUE DATE: Tuesday May 5**

**Motivation**

- This will count as a 100-point test in your grade (and you SHOULD do well since it is open notes/book).
- This will help your understanding of the material for both the Final Exam and the AP test.

**General Directions**

- **You should budget a total 3 – 7 hours for this test.**
- Answer all questions within the context of the problem where appropriate. PLEASE HIGHLIGHT FINAL ANSWERS (SENTENCES, IF NECESSARY).
- For “essay” questions, please format your paragraphs as if you were completing an SAT or equivalently important essay. Typed work for “essay” problems are fine, but sharing electronic work is strictly prohibited.
- Use of a calculator is assumed but be sure to demonstrate understanding of all concepts by showing relevant work.
- You may use the book, class notes or any other text for help. Please feel free to discuss GENERAL CONCEPTS with classmates and/or tutors.
- You may NOT verify or compare any answers with others.
- Study groups are encouraged within the guidelines set forth in previous two bullet points.
- All answers should use good statistical language and complete sentences. Say what needs to be said to be precise, clear and complete. Then move on to the next question.
- Turn in this paper, **with your signature**, with your answers on separate sheets of paper.
- Please note point values of questions are NOT uniform – the total point value of this test is 100 points.
- The more work you show, the more I can consider partial credit 😊

**IMPORTANT! – Each test has a different X value that is used repeatedly throughout the exam. You need to get your X value from Mr. G and write it here:**

X value for this test = \_\_\_\_\_

I \_\_\_\_\_ (your excellent name here), certify that I have followed the above rules with respect to this take home final exam. Specifically, I acknowledge that I may have discussed GENERAL CONCEPTS with others but I did NOT verify or compare answers with others.

\_\_\_\_\_  
Your excellent signature here!

😊 Good Luck! I hope you find this a good review for the AP test 😊

1. (10 points) You have the following set of eight test scores on an exam worth 110 points.

|          |         |         |     |         |         |         |         |
|----------|---------|---------|-----|---------|---------|---------|---------|
| $X - 19$ | $X - 9$ | $X - 4$ | $X$ | $X + 3$ | $X + 4$ | $X + 6$ | $X + 8$ |
|----------|---------|---------|-----|---------|---------|---------|---------|

a. Report a five number summary for these test scores.

[Redacted]

d. What is the IQR and range for your test scores?

e. [Redacted]

f. Report on any outliers in your test scores using BOTH mean and median based statistics.

g. If a teacher were to raise everyone's test scores **by 10 points**, how would the mean, median, IQR, standard deviation and range be affected?

h. If a teacher were to raise everyone's test scores **by 50 percent**, how would the mean, median, IQR, standard deviation and range be affected?

2. (5 points) Assume the number of points the LA Lakers score in any given game is normally distributed with a mean of  $X$  and a standard deviation of 20 points (total points in a game is  $N(X, 20)$ ).

[Redacted]

b. What is the probability in a given game the Lakers would score **more than** 110 points?

[Redacted]

e. What is the probability in a given game the Lakers will score between 70 and 110 points?

f. The probability that the Lakers score **at least**  $Y$  points is 25%. Find  $Y$ .

[Redacted]

3. (10 points) Statisticians have taken many different observations of the number of hours that Mr. G sleeps in a night and his crankiness index. A linear regression is done to see if there is any association between these variables. The results of the statistical analysis and the linear regression equation are reported below.

$$\text{(predicted) Crankiness index} = 48 - (X/100)(\text{hours of sleep})$$

$$\text{standard deviation of crankiness index} = 0.96 \text{ points}$$

$$\text{standard deviation of hours of sleep} = 0.90$$

- a. Predict Mr. G's crankiness index when his hours of sleep are 6.25
- b. How much does the predicted crankiness index change for each hour of sleep? Hint – be careful about the sign of this change!
- c. What is the predicted crankiness index for 0 hours of sleep?
- d. What is relationship between the standard deviations of the variables, the slope of the linear regression equation and  $r$ ?
- e. Find the correlation coefficient **and interpret this value.**
- f. Find the coefficient of determination **and interpret this value.**
- g. Make an appropriate causation argument based on your previous two answers.
- h. Predict the hours of sleep for a crankiness index of 39.25.
- i. [REDACTED]

d.

4. (5 points) Write one paragraph discussing the differences or similarities of the following.

- Census
- Sample survey
- Experiment
- Observational study

5. (5 points) Write one paragraph on planning and conducting surveys. Be sure to address the following.

- Populations, samples, and random selection
- Sources of bias in surveys
- Simple random sampling vs. Stratified random sampling

6. (5 points) Write two solid paragraphs on planning and conducting experiments while addressing the following.
- Characteristics of a well-designed and well-conducted experiment (Guiding principles)
  - Completely randomized design vs. randomized block design (including matched pairs design)

7. (10 points) You and your friend are throwing cards into a wastebasket from 20 feet away. Of course, you are much better than your friend since **the P(you make) = X/100** and the **P(friend makes) = .34**. Carry all probability answers to 4 decimal places.
- If your shots are independent, what is the probability that you **both** make the shot – P(A and B)?
  - If your shots are independent what is the probability that **at least one** of you make the shot P(A or B)?

[Redacted]

- Suppose you and your friend's shots are NOT independent and P(both make your shots) = 0.45. What is P(Your friend makes given you made it)?
- Suppose you and your friend's shots are NOT independent and that you would like to model the situation with a tree diagram. Use the below values to draw your tree diagram
  - P(You make) = X/100
  - P(Your friend makes given you make) = .3
  - P(Your friend makes given you did NOT make) = .4
- Using the tree diagram above, find P(your friend makes).
- Using the tree diagram above, find P(You make given your friend makes).


[Redacted]



[Redacted]

[Redacted]

[Redacted]

10. (10 points) You are going to shoot 50 free throws. Assume that all free throws are independent with the same probability of success on each free throw of  $X/100$ . **Once again, carry all probabilities to 4 decimal places.**
- How do you know this is a binomial setting?
  - How many shots do you expect to make?
  - What is the standard deviation of the number of shots that you expect to make?
  - What is the probability you will make exactly 40?
  - What is the probability you will make 40 or more shots?
  - Use the fact that a  $B(n,p) \sim N(np, \sqrt{np(1-p)})$  to find the probability of making between 35 and 40 shots (inclusive).
  - What is the probability that you will make your first shot **ON** the 3<sup>rd</sup> attempt?
  - What is the probability that you will make your first shot **BY** the 4<sup>th</sup> attempt? Careful – the answer to this is **1 minus** a formula in the book!
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11. (5 points) Under the same scenario as the question above, you would like run a simulation in order to determine how many times you can expect to make EXACTLY 3 shots in a row within the total 50 shots you take (starting the “streak” over if you make 3 shots). Describe in detail your simulation scheme. Be sure your scheme has the following components:
- How will you assign your numbers to determine a success/failure? Will you ignore any digits?
  - What is the OUTCOME of the simulation? What are you trying to “count”
  - What will constitute a trial?
  - How many times will you conduct a trial in order to get a reasonable answer?
  - How will you determine the quantitative value you are seeking over many trials?
  - Copy down and use the following row of random digits to carry out as much of a trial as you can according to your scheme (I realize you will not finish a complete trial).

74927 65344 09593 45729 00323 86730 96663 96763 09738 98435

12. (10 points) You have reason to know that the students in Mr. Hailey’s math class have a distribution of total points from the second semester that is normally distributed with a mean of 1000 points and a standard deviation of  $X$  points. Assume for this problem that Mr. Hailey teaches 500 students. Find the following
- What is the probability that a single student would score above 1050 points for the semester?
  - What would be the mean of the sampling distribution for the average number of points earned by 30 of Mr. Hailey’s students?
  - What would be the standard deviation of the sampling distribution for the average number of points earned by 30 of Mr. Hailey’s students?
  - What is the probability that the average number of points earned for 30 of his students would exceed 1020?
  - Would your answer to a) above change if the population was known to be NONnormal? Why or why not?
  - Would your answer to d) above change if the population was known to be NONnormal? Why or why not?
- 