

Name: _____

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AP Statistics — Practice Exam

Instructions: Answer all four questions. A graphing calculator is permitted. Show your methods clearly: a correct answer with no supporting work may receive no credit. Write every conclusion in the context of the question.

Time Limit: 50 minutes

Short Answer (2 questions)

- [4 points] 1. Comparing distributions. A consumer magazine tested 40 batteries of Brand A and 40 batteries of Brand B, recording how long each battery ran in a flashlight, in hours. For Brand A the five-number summary was: minimum 19, first quartile 22, median 24, third quartile 28, maximum 41; the mean was 25.3 hours and the standard deviation 4.6 hours. For Brand B the five-number summary was: minimum 14, first quartile 20, median 26, third quartile 31, maximum 36; the mean was 25.5 hours and the standard deviation 5.9 hours.
- [2 points] (a) Compare the distributions of running times for the two brands.

[1 point] (b) Using the 1.5 times IQR rule, determine whether the longest-running Brand A battery is an outlier. Show your work.

[1 point] (c) A camper needs a battery that will run for at least 30 hours on a single trip. Based on the summary statistics, which brand should the camper choose? Justify your answer.

[4 points] 2. Experimental design. A researcher wants to determine whether a new liquid fertilizer increases the yield of tomato plants, measured as the total mass of ripe tomatoes in kilograms per plant over a growing season. She has 40 tomato plants of the same variety in a greenhouse. Twenty of the plants are on a bench next to a south-facing window and receive much more sunlight; the other twenty are on a bench on the far side of the greenhouse. Plants given the fertilizer are watered with the fertilizer solution once a week; the other plants are watered with plain water on the same schedule.

[1 point] (a) Explain why a randomized block design, with the two benches as blocks, is preferable to a completely randomized design for this experiment.

- [2 points]** (b) Describe how the researcher should carry out the randomized block design. Include how the random assignment would be done and what will be compared.

- [1 point]** (c) Suppose the fertilized plants produce a significantly higher mean yield than the unfertilized plants. Can the researcher conclude that the fertilizer caused the higher yield? Can she generalize the result to all tomato plants of this variety? Explain both answers.

Calculations (2 questions)

[4 points] 3. Probability. An online retailer ships every order from one of two warehouses. Seventy percent of orders ship from warehouse A and thirty percent from warehouse B. Records show that 5 percent of the orders shipped from warehouse A arrive late, and 12 percent of the orders shipped from warehouse B arrive late. Assume orders are independent of one another.

[1 point] (a) Find the probability that a randomly selected order arrives late.

[1 point] (b) Given that an order arrives late, find the probability that it was shipped from warehouse B.

[1 point] (c) Are the events "the order arrives late" and "the order was shipped from warehouse B" independent? Justify your answer using probabilities.

[1 point] (d) Let X be the number of late orders among 10 randomly selected orders. Find the probability that at least one of the 10 orders arrives late, and find the mean and standard deviation of X .

[4 points] 4. Inference. A teacher wants to know whether spacing study sessions out over several days produces different test scores from cramming the same amount of study into one session. She randomly assigns 24 volunteer students to two groups of 12. The spaced group studies a unit for 30 minutes on each of four days; the massed group studies for two hours on a single day. All 24 students then take the same test. The spaced group has a mean score of 78.5 with a standard deviation of 6.2; the massed group has a mean score of 72.1 with a standard deviation of 7.4. Dotplots of the scores in

each group show no strong skewness and no outliers. Do the data provide convincing evidence, at the 5 percent significance level, that the mean test score differs between the two study methods?

[1 point]

(a) State the hypotheses, defining any parameters you use.

[1 point]

(b) Identify the appropriate test and verify that the conditions for it are met.

[1 point]

(c) Calculate the test statistic and the p-value.

[1 point] (d) State your conclusion in the context of the question.