CollegeBoard
Advanced Placement Program

AP® Statistics
2004 Scoring Commentary

Sample: 1 of 2
Score: 4

In part (a), the student correctly identifies the outliers in distribution A by marking them on the grid and showing the calculations below the graph. The boxplots are correctly constructed. The boxplots are identified for additive A and additive B, and the horizontal axis is correctly labeled. With all three components present, part (a) is essentially correct. In part (b) i, the student uses the fact that Q1 for distribution A is greater than zero to conclude that there were 75% of the cars that had increased mileage with additive A. The student also identifies that for distribution B, with the negative value of Q1 (and implied reference to a positive value of the median), between 50% and 75% of the cars with additive B show an increase. The student concludes that the proportion of increases for additive B must be less than for additive A, and this part is essentially correct. Part (b) ii describes the effect of the strongly skewed distribution on the mean of distribution B, moving the mean much above the median. Distribution A is described as "fairly symmetrical," which makes the mean and median close together for this distribution. Part (b) ii is essentially correct. This response earns a score of 4.

Sample: 2 of 2
Score: 4

In part (a), the student correctly identifies the outliers in distribution A both by marking them on the grid and with the calculations shown below the graph. The boxplots are correctly constructed. The boxplots are identified and the horizontal axis is correctly labeled. With all three components present, part (a) is essentially correct. In part (b) i, the student has correctly concluded that exactly 3 cars in distribution A had lower mileage with the additive, and at least 4 had lower mileage with additive B, by referring to the position of the lower quartile in each distribution. The student then describes that the resulting proportions for additive A that show increased mileage must be higher than for additive B. This part is essentially correct. Part (b) ii describes the effect of the strongly right skewed distribution on the mean of distribution B, moving the mean greater than the median. The opposite effect in distribution A, which results from a slightly left skewed distribution or the presence of low outliers, is described as well, making this part essentially correct. This response earns a score of 4.

Question 2

Sample: 1 of 2
Score: 4

In parts (a) and (b), the blocks are constituted correctly and the criteria are clearly identified. However, the criteria in part (a) would not have been given full credit if the student stopped after the first sentence; it is important that the student convey the notion of similarity of ages within each block. In part (c), the student earns full credit by stating the proposed method is not appropriate and describes an appropriate way to assign both treatments within each block, including a clear method of randomization. This response earns a score of 4.

Sample: 2 of 2
Score: 3

In parts (a) and (b), the blocks are constituted correctly and the criteria are clearly identified. In part (c), the student recognizes that the proposed method is not appropriate and states that each volunteer in a block receives a different treatment than the other member of the block. However, the student does not describe the method for randomly assigning the treatments and therefore receives only partial credit for part (c). This response earns a score of 3.

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Question 3

Sample: 1 of 2
Score: 4

All parts of this response are essentially correct. In part (a), the student clearly identifies which probability (the probability of a male femur) changes from trial to trial due to lack of replacement. In part (b), the work is correct; however, the response would have been better if the probabilities were identified as conditional.

The answer in part (c) is well written. The student answers this question by interpreting the answer given to part (b) correctly. The use of the word "exclusive" in part (d) is unclear, but the remaining discussion indicates that the student clearly knows why the result cannot be generalized. This response earns a score of 4.

Sample: 2 of 2
Score: 3

Parts (a), (b), and (c) are essentially correct. Part (d) is incorrect. In part (a), the first sentences do not contain errors, but they do not sufficiently address the consequences of sampling without replacement. The final two sentences make it clear that the student is concerned about the changing conditional probability of picking a male femur. The part (b) probability is computed with supporting work. The discrepancy in the student's answer is attributed to rounding off too early. The answer to part (c) is well written. The student answers this question by interpreting the answer given in part (b) correctly. While the student correctly states in part (d) that it is not reasonable to generalize, a correct justification is not provided. The student states a concern about the small sample size and the fact that all bones come from one area, but neither of these arguments addresses the issues of lack of random sampling and non-representation. The response earns a score of 3.

Sample: 1 of 2
Score: 4

The student correctly calculates the probability of a cure for each plan in part (a). In part (b), the statement correctly begins with all patients paying for the first antibiotic. In part (c), the student correctly recommends a plan based on the results obtained in parts (a) and (b). This response earns a score of 4.

Sample: 2 of 2
Score: 4

In part (a), the student understands that the probability of a cure under either Plan I or Plan II is P (A U B), where A and B are explicitly defined. In part (b), the student identifies the two possible values that the random variable cost will take on under each plan. Also, each of the corresponding probabilities is identified and the usual expected value formula is used and evaluated correctly. The mention in part (c) of the insurance company suggests this student understands the context of the problem. This response earns a score of 4.

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Question 5

Sample: 1 of 2
Score: 4

This response shows correct hypotheses, verification of conditions showing expected cell counts and how they are calculated, proper mechanics with formula and substitution, and a correct conclusion in context with justification. The response in part (b) indicates that a single random sample was taken from the population of interest. This response earns a score of 4.

Sample: 2 of 2
Score: 4

This paper shows correct hypotheses, verification of conditions with expected cell counts shown in the calculations, proper mechanics, and a correct conclusion in context with justification based on a stated alpha value. The response in part (b) indicates that a single random sample was taken from the population of interest. While indicating that the sample size is large is not a sufficient response, it is not contradictory to the correct response. This response earns a score of 4.

Question 6

Sample: 1 of 2
Score: 4

In part (a), the student correctly states assumptions and shows how he or she determined that the assumptions were met; clearly defines the interval procedure used, including stating the degrees of freedom; performs the correct mechanics, showing the details of the work; and provides a correct interpretation of the confidence interval in context. The response in part (b) is also quite strong: the student addresses the one-sided vs. two-sided nature of the procedures and indicates how the two-sided p-value would have led to the same decision as the confidence interval. In part (c), the student includes details of the correct calculations and interprets the results. In part (d), the student clearly states how the conclusion would differ, gives proper justification, and describes what the new conclusion would be. This response earns a score of 4.

Sample: 2 of 2
Score: 3

The student correctly calculates a t confidence interval but does not verify that the procedure was valid. The interpretation of the interval is strong, including both the confidence statement and the implications for the pharmaceutical company. The answer in part (b) is incorrect. The calculations in part (c) are correct, and the student makes a reasonable decision from the new confidence interval and indicates that "yes, the decision is different." Even though the student did not receive credit in part (b), he or she did correctly perform the one-sided interval calculations in part (c) and, with the nice interpretation of the confidence interval in part (a), earned a score of 3.