AP® STATISTICS
2017 SCORING GUIDELINES

Question 2

Intent of Question

The primary goals of this question are to assess a student's ability to (1) describe how to randomly assign participants to treatment groups; (2) identify the appropriate test procedure and hypotheses to answer a question of interest and (3) provide information about how to increase the power of a test in an experiment.

Solution

Part (a):

Number the participants from 1 to 60, then using a random number generator on a calculator, statistical software, or a random number table, choose 40 numbers out of 1 to 60 without replacement. Use the first 20 of those numbers to choose the 20 individuals to assign to the driving game, and the next 20 to choose the individuals to assign to the sports game. The remaining 20 individuals are assigned to the puzzle game.

Part (b):

The appropriate test is a two sample *t*-test for the difference in means.

Define μ_D to be the mean improvement time if everyone in the population were to play the driving game, and μ_S to be the mean improvement time if everyone in the population were to play the sports game.

The null hypothesis is $H_0 : \mu_D = \mu_S$ and the alternative hypothesis is $H_a : \mu_D \neq \mu_S$.

Part (c):

To increase power, the researchers should use a larger sample size and/or increase the significance level α. Using a larger sample size reduces the standard error of the sampling distribution, which increases the value of the test statistic, making it easier to detect a difference in the population means if it exists. Using a larger significance level makes it easier to reject a false null hypothesis, which also increases the power of the test.

AP® STATISTICS
2017 SCORING GUIDELINES

Question 2 (continued)

Scoring

Parts (a), (b) and (c) are scored as essentially correct (E), partially correct (P), or incorrect (I).

Part (a) is scored as follows:

Essentially correct (E) if the response includes a method that:
(1) Uses a random process;
(2) Guarantees equal probability of assignment;
(3) Results in 20 volunteers per group;
(4) Specifies which game is assigned to each group/volunteer.

Partially correct (P) if the response includes two or three of the components required for E.

Note: A response that simply states "Randomly Assign" is not providing a method, so it is scored I.

Incorrect if the response does not meet the criteria for E or P.

Part (b) is scored as follows:

Essentially correct (E) if the response:
(1) Identifies the correct test;
(2) Defines appropriate parameter(s) in context for the stated test;
(3) Specifies the correct null and alternative hypotheses consistent with the stated test.

Partially correct (P) if the response includes two of the three components required for E.

Incorrect if the response does not meet the criteria for E or P.

Note: If the response describes a block design in part (a), with blocks of 3 people of similar skill, then the appropriate test in part (b) is a paired *t*-test.

Part (c) is scored as follows:

Essentially correct (E) if the response:
- Identifies increasing the sample size or increasing alpha;
- Provides a reasonable statistical explanation that illustrates how their choice relates to power.

Partially correct (P) if the response includes the first component required for E
OR
Displays an understanding of the concept of power.

Incorrect if the response does not meet the criteria for E or P.