ANSWERS AND HINTS TO STUDY QUESTIONS (SQs)

CHAPTER 16: Analysis of Covariance

SQ16-1: The main purpose of ANCOVA is to (a) increase the test power by reducing the error variance, and (b) equate the compared groups on an ”extraneous” variable (covariate) that is linearly related to the dependent variable.

SQ16-2: The covariate, X, in ANCOVA with a dependent variable Y (a) must be meaningfully related to Y, (b) there must be a linear relationship between X and Y, and (c) the identification of groups compared with ANCOVA must not (explicitly or implicitly) be based on their scores on the covariate, X.

SQ16-3: In addition to the ANOVA assumptions (normality, homogeneity of variance, and independence of observations), ANCOVA assumes that (a) there is a linear relationship between the covariate, X, and the dependent variable, Y, and (b) when regressing Y on X for each group, all regression coefficients are equal for the population [homogeneity of regression slopes].

SQ16-4: YES, because unreliable measures of the covariate may result in different regression slopes across groups and biased estimates of treatment effects.

SQ16-5: NO, because the identification of the groups (short versus tall participants) will depend on their measures on the covariate (height).

SQ16-6: To compare the treatment groups on the posttest assuming that they have equal “start” on the pretest and to reduce the error variance thus increasing the power of the test.

SQ16-7: B.

SQ16-8: Because \( \hat{\varepsilon}_{ij} < \varepsilon_{ij} \), the error variance with ANCOVA (\( MS_W \) = variance of the \( \hat{\varepsilon}_{ij} \’s \)) is smaller than the error variance with ANOVA (\( MS_W \) = variance of the \( \hat{\varepsilon}_{ij} \’s \)) which, in turns, makes the F-test with ANCOVA more powerful than that with ANOVA.

SQ16-9: False.

SQ16-10: C.