Quick Questions 23  Correlation Analysis

I. Place the number of the appropriate formula, expression, or term next to the appropriate concept.
   A. Coefficient of determination
   B. Coefficient of correlation
   C. A range for
   D. Coefficient of nondetermination
   E. The test statistic (t) used to measure the significance of

II. Draw the following scatters and place the appropriate value for r in the space provided.

   Perfect Positive Correlation  
   Zero Correlation  
   Perfect Negative Correlation

III. Draw a scatter diagram showing how hours studying per weekend affect grade point average.

   Scatter Diagram of Hours Studying and Grade Point Average
   \[ \hat{y}_x = 1.81 + .282x \]

IV. Using the data in question III, calculate the following:
   A. Coefficient of correlation (to 3 decimal places)
   \[ r = \frac{n(\sum XY) - (\sum X)(\sum Y)}{\sqrt{(n(\sum X^2) - (\sum X)^2)(n(\sum Y^2) - (\sum Y)^2)}} = \frac{8(98.6) - (31)(23.2)}{\sqrt{(8(151) - (31)^2)(8(70.38) - (23.2)^2)}} = \frac{69.6}{247} = .889 \]
   B. Coefficient of determination
   \[ r^2 = (.889)^2 = .790 or 79.0\% \]
   C. Coefficient of nondetermination
   \[ \hat{a}^2 = 1 - r^2 = 1 - .790 = .210 or 21.0\% \]
   D. Interpret the answer to question IV B. Seventy-nine percent of grade variability is accounted for by study hour variability.

V. Could \( \rho \) (rho) be zero at the .01 level of significance?
   1. The null hypothesis and alternate hypothesis are \( H_0 : \rho = 0 \) and \( H_1 : \rho \neq 0 \).
   2. The level of significance will be .01 for this two-tail problem with \( n - 2 \) degrees of freedom.
   3. The relevant statistic will be \( r \).
   4. If \( t \) from the test statistic is beyond the critical value of \( t \), the null hypothesis will be rejected.
   5. Apply the decision rule.
   \[ df = n - 2 = 8 - 2 = 6 \rightarrow t = 3.707 \]
   \[ t = \frac{r - \rho}{\sqrt{1 - r^2}} \sqrt{\frac{n - 2}{6 - 2}} = 4.76 \]
   Reject \( H_0 \) because 4.76 > 3.707.
   Rho could not be zero.

QQ 150 and 151