MS Module 16 Regression summary statistics practice exam questions

(The attached PDF file has better formatting.)

[The practice problems in the 24 modules explain the statistical procedures; the practice exam questions in this thread shows what you will be asked on the final exam.]

A regression analysis on 11 data points has summary statistics

! $\Sigma x_i = 8$
! $\Sigma y_i = 15$
! $\Sigma x_i^2 = 41$
! $\Sigma y_i^2 = 55$
! $\Sigma x_i y_i = 41$

Question 16.1: $\bar{x}$

What is $\bar{x}$, the average X value?

Answer 16.1: 8 / 11 = 0.727273

(average = total / number of observations)

Question 16.2: $\bar{y}$

What is $\bar{y}$, the average Y value?

Answer 16.2: 15 / 11 = 1.363636

(average = total / number of observations)

Question 16.3: S_{xx}

What is S_{xx}, the sum of squares of the X values?

Answer 16.3: $41 - 0.727273^2 \times 11 = 35.182$

(S_{xx}, the sum of squared deviations of the X values, is $\Sigma x_i^2 - N \times \bar{x}^2$)

Question 16.4: S_{yy}

What is S_{yy}, the sum of squares of the Y values?

Answer 16.4: $55 - 1.363636^2 \times 11 = 34.545$

(S_{yy}, the sum of squares of the Y values, is $\Sigma y_i^2 - N \times \bar{y}^2$)

Question 16.5: S_{xy}

What is S_{xy}, the cross sum of squares of the X and Y values?

Answer 16.5: 41 − 8 × 15 / 11 = 30.091

(S_{xy}, the cross sum of squares of the X and Y values, is $\Sigma x_i y_i - N \times \bar{x} \times \bar{y} = \Sigma x_i y_i - \Sigma x_i \times \Sigma y_i / N$)

Question 16.6: Least squares estimate for β_1

What is the least squares estimate for β_1?

Answer 16.6: 30.091 / 35.182 = 0.855

(least squares estimate for $\beta_1 = S_{xy} / S_{xx}$)

Question 16.7: Least squares estimate for β_0

What is the least squares estimate for β_0?

Answer 16.7: 1.364 − 0.727 × 0.855 = 0.742

(least squares estimate for $\beta_0 = \bar{y} - \bar{x} \times \beta_1$)

Question 16.8: Error sum of squares

What is the error sum of squares?

Answer 16.8: 55 − 0.742 × 15 − 0.855 × 41 = 8.815; with more significant digits for β_0 and β_1, ESS = 8.809

(error sum of squares SSE is $\Sigma y_i^2 - \beta_0 \times \Sigma y_i - \beta_1 \times \Sigma x_i y_i$)

Question 16.9: Least squares estimate for σ^2

What is s^2, the least squares estimate for σ^2?

Answer 16.9: 8.809 / (11 − 2) = 0.979

(least squares estimate for σ^2 = error sum of squares / (number of observations − 2))

Question 16.10: Least squares estimate for σ

What is s, the least squares estimate for σ?

Answer 16.10: $0.979^{0.5}$ = 0.989

(standard deviation = square root of variance)

Question 16.11: Standard deviation of least squares estimate for β_1

What is the standard deviation of the least squares estimate for β_1?

Answer 16.11: $0.989 / 35.182^{0.5} = 0.167$

(the standard deviation of the least squares estimate for $\beta_1 = \sigma / S_{xx}^{0.5}$)

Question 16.12: R^2

What is the least squares estimate for R^2?

Answer 16.12: $1 - 8.809 / 34.545 = 0.745$

(the least squares estimate for $R^2 = 1 -$ error sum of squares $/ S_{yy}$)

Question 16.13: Correlation

What is the estimated correlation ρ between X and Y?

Answer 16.13: $30.091 / (35.182 \times 34.545)^{0.5} = 0.863$

(the estimated correlation ρ between X and Y $= S_{xy} / (S_{xx} \times S_{yy})^{0.5}$