Solution

Quiz 1, Stat 3

1. In the equation $E(Y) = b_0 + b_1 x$, what is the value of b_1 if x has no linear relationship to Y? Does this value indicate that there is no relationship between x and Y? Explain your answers. (3) $b_1 = 0$; no; there can be non-linear relation.

2. The following is the output from a regression analysis in R. Weight is measured in kg and height in cm. (5)

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Call:
lm(formula = weight ~ height)
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -101.3301    29.8617  -3.393  0.00105 **
height         0.9956     0.1676   5.939 5.92e-08 ***

Residual standard error: 10.07 on 86 degrees of freedom
Multiple R-squared:  0.2908
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   (a) What is the sample size? $86+2 = 88$

   (b) What is the estimated weight when height is 1.5 metres? $(1.5 \times 100 \times .9956 - 101.3301)$ kg

   (c) What is the estimated change in weight for 1cm change in height? $.9956$ kg

   (d) What is the sample correlation coefficient between height and weight? $\sqrt{.2908}$

   (e) What is the estimated variance of the error? $(10.07)^2$

3. Suppose we have paired data $(x_1, y_1), \cdots, (x_n, y_n)$ and we are interested in the regression line of y on x. (2)

   (a) What can you say about the least squares regression line when $x_1 = x_2 = \cdots = x_n$ and the y's are distinct? Let $x_1 = \cdots = x_n = x_0$. Any line passing through $(x_0, \bar{y})$

   (b) What can you say about the least squares regression line when $y_1 = y_2 = \cdots = y_n$ and the x's are distinct?

Horizontal Straight line $y = \bar{y}$.