1. I have 40 small pine seedlings scattered in a large forest. Using various instruments I measure \( R = \) rain reaching the seedling, and \( G = \) growth all over one growing season. I regress \( G \) on the other variable using PROC REG, obtaining corrected regression sum of squares 800 and corrected total sum of squares 1000. My estimated regression equation is
\[
\hat{G} = 10 + 0.5R
\]

Find, if possible:
(A) The error mean square MSE = ________
(B) The overall model F test ________

Choose the correct answer:
If the P-value for this F test is .0014 and we are doing a 5% significance level test (as usual) this tells us:
 i. We can leave out the explanatory variable (R) TRUE FALSE
 ii. We can leave out the intercept. TRUE FALSE

Complete blank
 i. Null Hypothesis being tested is ________________

(E) Suppose that \( (S_X)^{-1} \) is 0.0024.
 i. Compute from this the standard error for the regression coefficient of \( R \) in the model ________
 ii. Compute, if possible, a t test that the coefficient of \( R \) is just an estimate of 0. \( t = \) __________
1. Let \( G_i \) denote the weight gain for the firstborn male piglet in litter \( i \) over a given period of time and let \( P_i \) denote the number of other piglets (siblings) in the same litter. I observed \( n \) litters of pigs and fit a least squares line relating first born male weight gain \( G \) to number of siblings \( P \) so my model was \( G_i = \beta_0 + \beta_1 P_i + e_i \). The estimated model came out to \( \hat{G}_i = 80 - 0.5P_i \). My \( n \times 2 \) \( X \) matrix had a column of 1s and a column of \( P_i \) values as usual. I obtained

\[
X'X = \begin{bmatrix} 50 & 110 \\ 110 & 260 \end{bmatrix} \quad X'X = \begin{bmatrix} \sum_{i=1}^n 1 & \sum_{i=1}^n P_i \\ \sum_{i=1}^n P_i & \sum_{i=1}^n P_i^2 \end{bmatrix} = \begin{bmatrix} n & \text{Sum}_i P_i \\ \text{Sum}_i P_i & \text{Sum}_i P_i^2 \end{bmatrix}
\]

Answer the questions below, if possible, from this information (if not possible, put NP)

(a) (7 pts.) How many observations (litters) did I have in my experiment? \( n = \_50\_\)

(b) (7 pts.) Compute, if possible, the sum of the \( n \) weight gains in this experiment

\[
\sum_{i=1}^n G_i = 3945
\]

Use fact: intercept = G_mean – slope*P_mean

\[
b_0 = \bar{G} - b_1 \bar{P}
\]

\[
80 = \bar{G} - (-0.5) \times \frac{110}{50}
\]

\[
\bar{G} = 80 - 0.5 \times \frac{110}{50}
\]

\[
\sum_{i=1}^{90} G_i = 50 \times \left( 80 - 0.5 \times \frac{110}{50} \right) = 3945
\]

or

\[
80 = \text{G}_{\text{mean}} - (-0.5)*(110/50) ,
\]

thus, \( \text{G}_{\text{mean}} = 80 - 0.5*(110/50) \)

\[
\text{G}_{\text{SUM}} = \text{G}_{\text{Mean}}*50= 80*50 - 0.5*110=4000-55=3945
\]