Simple Linear Regression Examples

Question 1: Predicting House Prices

A real estate company collected data on houses sold in a suburban area. The dataset includes the size of the house in square feet and the selling price in thousands of dollars.

House ID	Size (sqft)	Price ($1000s)
1	1200	200
2	1500	240
3	1600	250
4	1700	265
5	1850	275
6	1900	295

Tasks:

a) Fit a simple linear regression model to predict Price from Size.

b) Interpret the slope and intercept.

c) Predict the price of a 1800 sqft house.

d) Calculate the residual for a house of 1500 sqft sold for $240,000.

e) Report the R^2 value and explain the model's fit.

f) Perform an F-test to determine the model’s significance.

Question 2: Analyzing Study Time vs Exam Scores

A group of students recorded the number of hours they studied and their resulting exam scores.

Student	Study Hours	Exam Score
A	2	55
B	4	65
C	6	80
D	8	88
E	10	94
F	12	95

Tasks:

a) Fit a linear regression model with Study Hours as the predictor.

b) Interpret model coefficients.

c) Predict the exam score for a student who studied 9 hours.

d) Compute the residual for a student who studied 4 hours and scored 65.

e) What does R^2 tell you in this case?

f) Is the relationship statistically significant at the 0.05 level?

Question 3: Marketing Spend vs Customer Acquisition

A marketing team measured how different levels of digital ad spend impacted the number of new customers acquired.

Campaign	Ad Spend ($100s)	New Customers
1	2	10
2	3	14
3	5	22
4	6	25
5	7	29
6	8	35

Tasks:

a) Fit a simple linear regression model.

b) Interpret the intercept and slope.

c) Predict the number of customers if $600 is spent.

d) Calculate the residual for a campaign that spent $500 and got 22 customers.

e) Evaluate model strength using R^2.

f) Construct an ANOVA table and perform the F-test.

Question 4: Website Load Time and Bounce Rate

A UX team wants to explore whether page load time affects the website's bounce rate (percentage of users who leave immediately).

Website	Load Time (sec)	Bounce Rate (%)
A	1.2	20
B	2.1	35
C	3.0	50
D	4.2	60
E	5.3	72
F	6.1	81

Tasks:

a) Create a linear regression model predicting Bounce Rate from Load Time.

b) Interpret coefficients.

c) Estimate the bounce rate for a load time of 3.5 seconds.

d) Calculate the residual for a 2.1-second load time with a 35% bounce rate.

e) Report R^2 and comment on predictive strength.

f) Use the F-test to assess model significance.