

Assignment #3, Due 7/20/2026 or 7/21/2026

1. The following data show the results of an aptitude test (Y) and the grade point average of 10 students.

Aptitude Test	
Score (Y)	GPA (X)
26	1.8
31	2.3
28	2.6
30	2.4
34	2.8
38	3.0
41	3.4
44	3.2
40	3.6
43	3.8

- Develop a least squares estimated regression line.
 - Compute the coefficient of determination and comment on the strength of the regression relationship. Is the slope significant? Use a t test and let $\alpha = 0.05$.
 - Construct a 95% confidence interval for the estimate of slope.
 - Perform an F test to determine if the model is significant ($\alpha = 0.05$).
2. Occasionally, it has been the case that home prices and mortgage rates dropped so low that in a number of cities the monthly cost of owning a home was less expensive than renting. The following data show the average asking rent for 10 markets and the monthly mortgage on the median priced home for 10 cities where the average monthly mortgage payment was less than the average asking rent.
- Develop the estimated regression equation that can be used to predict the monthly mortgage given the average asking rent.
 - Construct a residual plot against the independent variable.
 - Do the assumptions about the error term and model form seem reasonable in light of the residual plot?

City	Rent (\$)	Mortgage (\$)
Atlanta	840	539
Chicago	1062	1002
Detroit	823	626
Jacksonville, Fla.	779	711
Las Vegas	796	655
Miami	1071	977
Minneapolis	953	776
Orlando, Fla.	851	695
Phoenix	762	651
St. Louis	723	654

3. A regression analysis resulted in the following information regarding an independent variable (x) and a dependent variable (y).

$$\begin{aligned}\Sigma x &= 42 & \Sigma(y - \bar{y})(x - \bar{x}) &= 37 \\ \Sigma y &= 63 & \Sigma(x - \bar{x})^2 &= 84 \\ n &= 7 & \Sigma(y - \bar{y})^2 &= 28 \\ & & \Sigma(y - \bar{y})^2 &= 11.7024\end{aligned}$$

- Develop the least squares estimated regression equation.
 - At a 0.05 level of significance, perform a t test and determine whether or not the slope is significantly different from zero.
 - Perform an F test to determine whether or not the model is significant. ($\alpha = 0.05$)
 - Compute the coefficient of determination.
4. A computer manufacturer has developed a regression model relating Sales (y in \$10,000) with four independent variables. The four independent variables are Price (in dollars), Competitor's Price (in dollars), Advertising (in \$1000), and Type of computer produced (Type = 0 if desktop, Type = 1 if laptop). Part of the regression results are shown below.

ANOVA			
	<i>df</i>	<i>SS</i>	<i>MS</i>
<i>Regression</i>	4	27641631	6910407
<i>Residual</i>	35	42277876	1207939

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
<i>Intercept</i>		2268.233	1237.880
<i>Price</i>		-0.803	0.316
<i>Competitor's Price</i>		0.859	0.281
<i>Advertising</i>		0.216	0.079
<i>Type</i>		567.806	373.400

- What has been the sample size?
- Determine the multiple coefficient of determination.
- Compute the test statistic t for each of the four independent variables.
- Determine the p-values for the four variables.
- At the 5% level, which variables are significant? Explain how you arrived at your conclusion.
- At $\alpha = 0.05$, test to see if the regression model is significant.

5. **Analyzing College Grade Point Average.** The admissions officer for Clearwater College developed the following estimated regression equation relating final college GPA to the student's SAT mathematics score and high-school GPA.

$$y = 21.41 + .0235x_1 + .00486x_2$$

where x_1 = high-school grade point average

x_2 = SAT mathematics score

y = final college grade point average

A portion of the associated computer output follows.

The regression equation is

$$Y = -1.41 + .0235 X_1 + .00486 X_2$$

Predictor	Coef	SE Coef	T
Constant	-1.4053	.4848	_____
X1	.023467	.008666	_____
X2	_____	.001077	_____

S = .1298 R-Sq = _____ R-Sq (adj) = _____

Analysis of Variance

SOURCE	DF	SS	MS	F
Regression	_____	1.76209	_____	_____
Residual Error	_____	_____	_____	
Total	9	1.88000		

- Complete the missing entries in this output.
- Use the F test and a .05 level of significance to see whether a significant relation- ship is present.
- Use the t test and $\alpha = .05$ to test $H_0: \beta_1 = 0$ and $H_0: \beta_2 = 0$.
- Did the estimated regression equation provide a good fit to the data? Explain.