

04b Sample Examination Problems Chapter 13

1. (a) Write down a sum of squares identity for a multiple regression model, and show how it implies that the solution of the least squares equations is a least squares estimator.
- (b) The following output is from a regression of record times in hours for Scottish Hill Races on the explanatory variables of distance run in miles and height climbed in feet. These were discussed by A.C. Atkinson in a paper in 'Statistical Science' in 1986.

Coefficients:

	Value	Std. Error	t value	Pr(> t)
(Intercept)	-8.9920	4.3027	-2.0898	0.0447
dist	6.2180	0.6011	10.3435	0.0000
climb	0.0110	0.0021	5.3869	0.0000

Residual standard error: 14.68 on 32 degrees of freedom
 Multiple R-Squared: 0.9191
 F-statistic: 181.7 on 2 and 32 degrees of freedom, the p-value is 0

Analysis of Variance Table

Response: time

Terms added sequentially (first to last)

	Df	Sum of Sq	Mean Sq	F Value	Pr(F)
dist	1	71996.89	71996.89	334.2926	000000e+000
climb	1	6249.74	6249.74	29.0185	6.445183e-006
Residuals	32	6891.87	215.37		

- i. What is the fitted model? Interpret the model.
- ii. What is the estimated value of the record time in hours for The Goatfell Hill Race which has distance 8.0 miles and height climbed 2866 feet?
- iii. How would you interpret the value of R^2 ?
- iv. What diagnostic plots would you suggest for these data?

