

Part I. (80 points) Do all calculations in SAS. Use a word processor of your choice to write a report. Insert computer text output and graphics to support what you are saying, but you need to write something that looks like an academic paper — not a pile of computer output. Turn in a hard copy of your HW in class (i.e., don't email me your HW). Also:

1. Clearly specify parameters and hypotheses when appropriate.
2. Write a coherent conclusion.

(80^{pts})

1. Alloy fastener failures

The following data are from a study on the compressive strength of an alloy fastener used in the construction of aircraft. Ten pressure loads, increasing in units of 200 psi from 2500 psi to 4300 psi, were used with different numbers of fasteners being tested at each of the loads. The table below gives the number of fasteners failing out of the number tested at each load.

Load	Tested	Failed
2500	50	10
2700	70	17
2900	100	30
3100	60	21
3300	40	18
3500	85	43
3700	90	54
3900	50	33
4100	80	60
4300	65	51

- (a) (10 pts) Compute the observed proportion of fasteners failing at each load. Plot the observed proportions against load and comment on how the proportion of failures depends on load.
- (b) (10 pts) Present a graphical summary that provides information on the adequacy of a logistic regression model relating the probability of fastener failure as a function of load. Discuss.
- (c) (10 pts) *Use the LOGISTIC procedure for the remaining parts.*
Fit a logistic model relating the probability of fastener failure to load. Look at the likelihood ratio goodness-of-fit statistic. Is there evidence of any gross deficiencies with the model?
- (d) (10 pts) Does load appear to be a useful predictor of the probability of failure? Do a formal hypothesis test.
- (e) (10 pts) Provide an equation relating the fitted probability of fastener failure to the load.
- (f) (10 pts) Plot the fitted probabilities as a function of load.
- (g) (10 pts) Compute the estimated probability of failure when the load is 3400 psi. Provide a 95% CI for this probability.
For the last two parts you can augment the data set with a case
3400 . .
having missing numbers tested and failed. Then save and print out the relevant summaries to answer the questions.
- (h) (10 pts) Write a short yet complete summary.

80 pts

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