Statistics 506
Test 1

1. In the ball bearing experiment, even though the A, B and AB effects seemed large, they were difficult to distinguish from error. It may be the case that a transformation of the response would make effects easier to detect. With lifetime data, a log transformation is often appropriate.

   (a) Using the responses below, take the natural log of the lifetime and analyze the data (i.e., compute effects, construct a normal probability plot and an interaction plot if necessary).

   (b) Interpret the results of your analysis. In particular, was the log transformation effective at reducing experimental error?

(A,B,C)	Response (hours)
(S,S,S)	17
(S,S,M)	19
(S,M,S)	25
(S,M,M)	21
(M,S,S)	26
(M,S,M)	16
(M,M,S)	85
(M,M,M)	128

2. In the experiments below, a factorial design was replicated 1 time, 4 times, 16 times and 100 times and the mean for each combination of factor levels was recorded. Compute factor effects for each of the 4 experiments (*Caution: Do not analyze this as a replicated experiment*).

   (a) Which effects seem to be real? What is their magnitude?

   (b) What was the minimum number of replications (1, 4, 16 or 100) needed to conclude that each of the effects you mentioned above was real?

   (c) Using your answers in **??** and **??** above, construct a plot of effect size vs minimum number of replications. How many replications would be necessary to detect an effect size of 15?

Factor settings	1 Rep	4 Reps	16 Reps	100 Reps
(L,L,L)	129	149	139	142
(H,L,L)	162	141	142	144
(L,H,L)	130	120	125	128
(H,H,L)	128	131	123	126
(L,L,H)	141	131	134	132
(H,L,H)	127	131	134	133
(L,H,H)	153	151	160	155
(H,H,H)	164	146	157	157