18. Nest Cavities. Using the nest cavity data in Display 5.21, estimate the difference between the average of the mean entry areas for flickers, screech owls, and kestrels and the average of the mean entry areas for the other six animals (on the transformed scale). Use a contrast of means.

19. Diet Restriction. For the data in Display 5.1 (and the summary statistics in Display 5.2), obtain a 95% confidence interval for the difference $\mu_3 - \mu_2$ using the Tukey–Kramer procedure. How does this interval differ from the LSD interval? Why is the Tukey–Kramer procedure the wrong thing to use for this problem?

20. Equity in Group Learning. [Continuation of Exercise 5.22.] (a) To see if the performance of low-ability students increases steadily with the ability of the best student in the group, form a linear contrast with increasing weights: -3 = Low, -1 = Low–Medium, $+1$ = Medium–High, and $+3$ = High. Estimate the contrast and construct a 95% confidence interval. (b) For the High-ability students, use multiple comparisons to determine which group composition differences are associated with different levels of test performance.

Data Problems

21. Failure Times of Bearings. The data in Display 6.11 are the times to fatigue failure (in units of millions of cycles) for 10 high-speed turbine engine bearings made from five different compounds. Which compounds tend to differ in their performance from the others? Analyze the data and write a brief statistical report including a summary of statistical findings, a graphical display, and a details section describing the details of the particular methods used. (Data from J. I. McCool, "Analysis of Single Classification Experiments Based on Censored Samples from the Two-parameter Weibull Distribution," *Journal of Statistical Planning and Inference*, 3 (1979): 39–68.

1 Failure times of bearings (millions of cycles)

Type of compound				
I	II	III	IV	V
3.03	3.19	3.46	5.88	6.43
5.53	4.26	5.22	6.74	9.97
5.60	4.47	5.69	6.90	10.39
9.30	4.53	6.54	6.98	13.55
9.92	4.67	9.16	7.21	14.45
12.51	4.69	9.40	8.14	14.72
12.95	5.78	10.19	8.59	16.81
15.21	6.79	10.71	9.80	18.39
16.04	9.37	12.58	12.28	20.84
16.84	12.75	13.41	25.46	21.51

22. A Biological Basis for Homosexuality. Is there a physiological basis for sexual preference? Following up on research suggesting that certain cell clusters in the brain govern sexual behavior, Simon LeVay (Data from S. LeVay, "A Difference in Hypothalamic Structure Between Heterosexual and Homosexual Men," *Science*, 253 (August 30, 1991): 1034–37) measured the volumes of four cell groups in the interstitial nuclei of the anterior hypothalamus in postmortem tissue from 41 subjects at autopsy from seven metropolitan hospitals in New York and California. The volumes of one