

Chapter 24 Handins:
Chapter 24: 24.4, 24.14, 24.24, 24.26, 24.30

24.4. (a) The stemplots (right) show no extreme outliers or skewness. **(b)** The means suggest that a dog reduces heart rate, but being with a friend appears to raise it. **(c)** $F = 14.08$ and $P = 0.000$ (meaning $P < 0.0005$), which means we reject $H_0: \mu_P = \mu_F = \mu_C$ in favor of H_a : at least one mean is different. Based on the confidence intervals, it appears that the mean heart rate is lowest when a pet is present (although this interval overlaps the control interval) and is highest when a friend is present (although again, this interval overlaps the control interval).

Dog	Friend	Alone
5 9	5	5
6 4	6	6 3
6 5999	6	6
7 0002	7	7 13
7 6	7 7	7 58
8 0	8 023	8 0
8 56	8 78	8 555778
9	9 012	9 02
9 8	9 78	9 9
10	10 0112	10

24.14. Since all the averages given are negative, we can work with their absolute values and reach the same conclusions. The details of the computations, with $k = 5$ and $N = 222$, are:

$$\begin{aligned}\bar{x} &\doteq 2.08 && \doteq \frac{46 \times 2.2 + 44 \times 2.0 + 44 \times 2.0 + 41 \times 2.2 + 47 \times 2.0}{222} \\ \text{SSG} &\doteq 2.116 && \doteq 46(2.2 - \bar{x})^2 + 44(2.0 - \bar{x})^2 + 44(2.0 - \bar{x})^2 \\ &&& \quad + 41(2.2 - \bar{x})^2 + 47(2.0 - \bar{x})^2 \\ \text{MSG} &\doteq 0.529 && \doteq \frac{2.116}{5 - 1} \\ \text{SSE} &\doteq 141.260 && \doteq 45 \times 0.7^2 + 43 \times 0.9^2 + 43 \times 0.8^2 + 40 \times 0.7^2 + 46 \times 0.9^2 \\ \text{MSE} &\doteq 0.651 && \doteq \frac{141.260}{222 - 5} \\ F &\doteq 0.813 && \doteq \frac{0.529}{0.651}\end{aligned}$$

The ANOVA is not significant ($P = 0.518$), but this is not surprising because the samples were created at random. This confirms that the groups are not significantly different at the beginning of the study. This is important information when analyzing the results after treatment.

24.24. The populations are American adult men of four different age groups (20s, 30s, 40s, and 50s). The response variable is the weight in pounds. There are $k = 4$ populations; the sample sizes are listed in the table and the total sample size is $N = 2790$. The degrees of freedom are therefore $k - 1 = 3$ and $N - k = 2786$.

24.26. The populations are eight-year-old American girls at three different time periods (1965, 1980, and 2002). The response variable is the BMI, body mass index. There are $k = 3$ populations; the sample sizes are shown in the table and the total sample size is $N = 922$. The degrees of freedom are therefore $k - 1 = 2$ and $N - k = 919$.

24.30. Only Design A would allow use of one-way ANOVA because it produces four independent sets of numbers. The data resulting from Design B would be dependent (a subject's responses to the first list would be related to that same subject's responses to the other lists), therefore, ANOVA would not be appropriate for comparison.