(1) using the **Rehabilitation therapy** data for Problems 16.9, 22.11 and 22.12 [see below]:

(a) Test whether or not the treatment regression lines have the same slope. What is the \( P \)-value of this test, and what is your conclusion?

(b) Using the ANCOVA model assuming parallel regressions (equivalent to eqn. 22.3), test for treatment effects. What is the \( P \)-value of this test, and what is your conclusion?

(c) Conduct a one-way ANOVA testing for treatment effects, without using the age covariate. Compare the MSEs of the ANCOVA and ANOVA; is the former substantially smaller than the latter, and does the difference affect the conclusion reached about treatment effects? Does it affect the \( P \)-value?

(d) Estimate the mean number of days required for therapy for patients of average physical fitness and age 24 years, with a confidence interval.

(e) Make all pairwise comparisons between the treatment effects. State what method you used and why. State your findings.

(2) **24.7 (a)–(e)** [23.7 in 4th ed.]

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**Rehabilitation therapy** data:

A rehabilitation center researcher was interested in examining the relationship between physical fitness prior to surgery of persons undergoing corrective knee surgery and time required in physical therapy until successful rehabilitation. Patient records in the rehabilitation center were examined, and 24 male subjects ranging in age from 18 to 30 years who had undergone similar corrective knee surgery during the past year were selected for the study. The variables for each patient are:

- number of days required for successful completion of physical therapy
- prior physical fitness status, coded as 1 = below average, 2 = average, 3 = above average
- patient number (arbitrary)
- age

The first and last two observations are:

\[
\begin{array}{cccc}
29.0 & 1 & 1 & 18.3 \\
42.0 & 1 & 2 & 30.0 \\
& & \cdots & \\
23.0 & 3 & 5 & 21.7 \\
22.0 & 3 & 6 & 20.0
\end{array}
\]