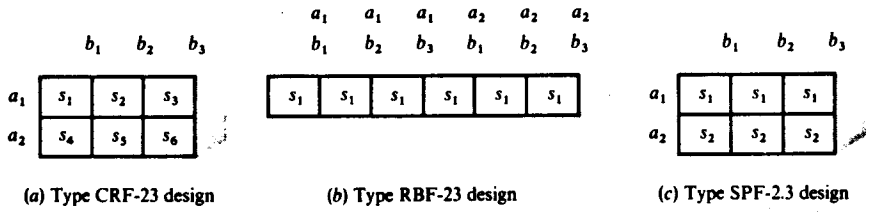
## A COMPARISON OF THREE FACTORIAL EXPERIMENTS

A graphic comparison of three experimental designs—a completely randomized factorial design, a randomized block factorial design, and a split-plot design—is shown in Figure 8.1-1. In this figure the split-plot




(*a*) Type CRF-23 design (*b*) Type RBF-23 design (*c*) Type SPF-2.3 design

**Figure 8.1-1 Comparison of three types of designs.**

repeated measures design is designated by SPF-2.3. The letters $s_1, s_2 \ldots s_6$ refer to sets of $n$ subjects. In the type CRF-23 design, each set of subjects receives only one of the $pq$ treatment combinations. An examination of part (*a*) reveals that the design is composed of two completely randomized designs. Subjects assigned to treatment level $a_1$ comprise one type CR-3 design, while subjects assigned to $a_2$ comprise the other type CR-3 design. The building block for the designs shown in parts (*b*) and (*c*) is a randomized block design. In a type RBF-23 design, a single set of subjects ($s_1$) receives all $pq$ treatment level combinations. By contrast, in a split-plot design subjects in set $s_1$ receive only one level of treatment $A$ but all levels of treatment $B$. The analysis of treatments $A$ and $B$ in a split-plot design, when viewed separately, resembles the analysis for a completely randomized design and a randomized block design, respectively. This analogy is discussed in Section 8.4.

## SPECIAL FEATURES OF SPLIT-PLOT DESIGNS

Split-plot repeated measures designs in which a subject receives all levels of some treatments but only one level of other treatments are sometimes referred to as *mixed designs* (Lindquist, 1953). Winer (1962) uses the designation "multifactor experiments having repeated measures on some elements" for this class of designs.

The origin of the term *mixed design* as a designation for split-plot designs can be readily discerned from an inspection of Figure 8.1-1*c*. In this figure differences between levels $a_1$ and $a_2$ involve differences between $s_1$ and $s_2$ as well as the effects of treatment $A$. However, differences between any two levels of treatment $B$ do not involve differences between