corresponding parametric test and **efficiency** rating. Table 13-2 shows that several nonparametric tests have efficiency ratings above 0.90, so the lower efficiency might not be an important factor in choosing between parametric and nonparametric tests. However, because parametric tests do have higher efficiency ratings than their nonparametric counterparts, it's generally better to use the parametric tests when their required assumptions are satisfied.

Table 13-2 Efficiency: Comparison of Parametric and Nonparametric Tests

Application	Parametric Test	Nonparametric Test	Efficiency Rating of Nonparametric Test with Normal Populations
Matched pairs of sample data	*t* test or *z* test	Sign test	0.63
		Wilcoxon signed-ranks test	0.95
Two independent samples	*t* test or *z* test	Wilcoxon rank-sum test	0.95
Several independent samples	Analysis of variance (*F* test)	Kruskal-Wallis test	0.95
Correlation	Linear correlation	Rank correlation test	0.91
Randomness	No parametric test	Runs test	No basis for comparison

Ranks

In Sections 13-3 through 13-6 we use methods based on ranks, which are defined below.

DEFINITION Data are *sorted* when they are arranged according to some criterion, such as smallest to largest or best to worst. A **rank** is a number assigned to an individual sample item according to its order in the sorted list. The first item is assigned a rank of 1, the second item is assigned a rank of 2, and so on.

Handling Ties If a tie in ranks occurs, a very common procedure is to find the mean of the ranks involved and then assign this mean rank to each of the tied items, as in the following example.

Example 1 The numbers 4, 5, 5, 5, 10, 11, 12, and 12 are given ranks of 1, 3, 3, 3, 5, 6, 7.5, and 7.5, respectively. The table below illustrates the procedure for handling ties.

Sorted Data	Preliminary Ranking		Rank
4	1		**1**
5	2		**3**
5	3	Mean is 3.	**3**
5	4		**3**
10	5		**5**
11	6		**6**
12	7		**7.5**
12	8	Mean is 7.5.	**7.5**