

value is the probability of getting x or fewer successes among n trials. *Double this value for two-tailed tests.* The final result is the P -value.

XLSTAT XLSTAT can be used for claims involving matched pairs by selecting **Nonparametric tests**, then **Comparison of two samples**.

TI-83/84 PLUS The TI-83/84 Plus calculator does not have a built-in function dedicated to the sign test, but you can use the `binomcdf` function to find the P -value for a sign test. Press **2ND** **VARS** (to get the **DISTR** menu); then scroll down to select **binomcdf**. Complete the entry of `binomcdf(n, p, x)` with n for the total number of plus and minus signs, 0.5 for p , and the number of the less frequent sign for x . Now press **ENTER**, and the result will be the

probability of getting x or fewer successes among n trials. *Double this value for two-tailed tests.* The final result is the P -value, so reject the null hypothesis if the P -value is less than or equal to the significance level. Otherwise, fail to reject the null hypothesis.

STATCRUNCH You can use StatCrunch to test the claim that a single list of values is from a population with a median equal to some specified value. Click **Open StatCrunch**. First enter the column of data or open a data set. Click on **Stat**, select **Nonparametrics**, then select **Sign Test**. Identify the column to be used, click on **Next** and enter the value of the claimed population median. Click on **Calculate** and the display will include the P -value.

13-2 Basic Skills and Concepts

Statistical Literacy and Critical Thinking

1. Sign Test for Freshman 15 The table below lists some of the weights from Data Set 4 in Appendix B. Those weights were measured from college students in September and later in April of their freshman year. Assume that we plan to use the sign test to test the claim of no difference between September weights and April weights. What requirements must be satisfied for this test? Is there any requirement that the populations must have a normal distribution or any other specific distribution? In what sense is this sign test a “distribution-free test”?

September weight	67	53	64	74	67	70	55	74	62	57
April weight	66	52	68	77	67	71	60	82	65	58

2. Identifying Signs For the sign test described in Exercise 1, identify the number of positive signs, the number of negative signs, the number of ties, the sample size n that is used for the sign test, and the value of the test statistic.

3. Contradicting H_1 An important step in conducting the sign test is to determine whether the sample data contradict the alternative hypothesis H_1 . For the sign test described in Exercise 1, identify the null hypothesis and the alternative hypothesis, and explain how the sample data contradict or do not contradict the alternative hypothesis.

4. Efficiency of the Sign Test Refer to Table 13-2 in Section 13-1 and identify the efficiency of the sign test. What does that value tell us about the sign test?

In Exercises 5–8, assume that matched pairs of data result in the given number of signs when the value of the second variable is subtracted from the corresponding value of the first variable. Use the sign test with a 0.05 significance level to test the null hypothesis of no difference.

5. Positive signs: 13; negative signs: 1; ties: 0 (from a preliminary test of the MicroSort method of gender selection)

6. Positive signs: 15; negative signs: 5; ties: 7 (from a class project testing for the difference between reported and measured heights of females)

7. Positive signs: 856; negative signs: 151; ties: 57 (from a Pew Research Center poll of adults who were asked if they know what Twitter is)