11. The test statistic of $z = -0.53$ does not fall in the critical region bounded by $z = -1.96$ and 1.96. There is not sufficient evidence to warrant rejection of the claim of no difference. There does not appear to be a difference.
13. The test statistic of $z = -10.90$ is in the critical region bounded by $z = -2.575$ and 2.575. There is sufficient evidence to warrant rejection of the claim of no difference. The YSORT method appears to have an effect on the gender of the child. (Because so many more boys were born than would be expected with no effect, it appears that the YSORT method is effective in increasing the likelihood that a baby will be a boy.)
15. The test statistic of $z = -1.97$ is not in the critical region bounded by $z = -2.575$ and 2.575. There is not sufficient evidence to warrant rejection of the claim that the touch therapists make their selections with a method equivalent to random guesses. The touch therapists do not appear to be effective in selecting the correct hand.
17. The test statistic of $z = -2.37$ is not in the critical region bounded by $z = -2.575$ and 2.575. There is not sufficient evidence to warrant rejection of the claim that the median is equal to 5.670 g. The quarters appear to be minted according to specifications.
19. The test statistic of $z = -5.32$ is in the critical region bounded by $z = -1.96$ and 1.96. There is sufficient evidence to warrant rejection of the claim that the median amount of Coke is equal to 12 oz. Consumers are not being cheated because they are generally getting more than 12 oz of Coke, not less.
21. Second approach: The test statistic of $z = -4.29$ is in the critical region bounded by $z = -1.645$, so the conclusions are the same as in Example 4. Third approach: The test statistic of $z = -2.82$ is in the critical region bounded by $z = -1.645$, so the conclusions are the same as in Example 4. The different approaches can lead to very different results; see the test statistics of -4.21, -4.29, and -2.82. The conclusions are the same in this case, but they could be different in other cases.

Section 13-3

1. The only requirements are that the matched pairs be a simple random sample and the population of differences be approximately symmetric. There is no requirement of a normal distribution or any other specific distribution. The Wilcoxon signed-ranks test is "distribution free" in the sense that it does not require a normal distribution or any other specific distribution.
3. The sign test uses only the signs of the differences, but the Wilcoxon signed-ranks test uses ranks that are affected by the magnitudes of the differences.
5. Test statistic: $T = 6$. Critical value: $T = 8$. Reject the null hypothesis that the population of differences has a median of 0. There is sufficient evidence to warrant rejection of the claim of no difference. There does appear to be a difference.
7. Convert $T = 247$ to the test statistic $z = -0.32$. Critical values: $z = \pm 1.96$. (Tech: P-value $= 0.751$.) Fail to reject the null hypothesis that the population of differences has a median of 0. There is not sufficient evidence to warrant rejection of the claim of no difference. There does not appear to be a difference.
9. Convert $T = 196$ to the test statistic $z = -2.88$. Critical values: $z = \pm 2.575$. (Tech: P-value $= 0.004$.) There is sufficient evidence to warrant rejection of the claim that the median is equal to 5.670 g. The quarters do not appear to be minted according to specifications.
11. Convert $T = 15.5$ to the test statistic $z = -4.82$. Critical values: $z = \pm 1.96$. (Tech: P-value $= 0.000$.) There is sufficient evidence to warrant rejection of the claim that the median amount of Coke is equal to 12 oz. Consumers are not being cheated because they are generally getting more than 12 oz of Coke, not less.
13. a. 0 and 2850
    b. 1425 c. 2000
    d. $\frac{n(n+1)}{2} - k$

Section 13-4

1. Yes. The two samples are independent because the flight data are not matched. The samples are simple random samples. Each sample has more than 10 values.
3. H_0: Arrival delay times from Flights 19 and 21 have the same median. There are three different possible alternative hypotheses:
   H_1: Arrival delay times from Flights 19 and 21 have different medians.
   H_1: Arrival delay times from Flight 19 have a median greater than the median of arrival delay times from Flight 21.
   H_1: Arrival delay times from Flight 19 have a median less than the median of arrival delay times from Flight 21.
5. $R_1 = 137.5$, $R_2 = 162.5$, $\mu_R = 150$, $\sigma_R = 17.321$, test statistic: $z = -0.72$. Critical values: $z = \pm 1.96$. (Tech: P-value $= 0.4705$.) Fail to reject the null hypothesis that the populations have the same median. There is not sufficient evidence to warrant rejection of the claim that Flights 19 and 21 have the same median arrival delay time.
7. $R_1 = 253.5$, $R_2 = 124.5$, $\mu_R = 182$, $\sigma_R = 20.607$, test statistic: $z = 3.47$. Critical values: $z = \pm 1.96$. (Tech: P-value $= 0.0005$.) Reject the null hypothesis that the populations have the same median. There is sufficient evidence to reject the claim that for those treated with 20 mg of atorvastatin and those treated with 80 mg of atorvastatin, changes in LDL cholesterol have the same median. It appears that the dosage amount does have an effect on the change in LDL cholesterol.
9. $R_1 = 501$, $R_2 = 445$, $\mu_R = 484$, $\sigma_R = 41.158$, test statistic: $z = 0.41$. Critical value: $z = 1.645$. (Tech: P-value $= 0.3398$.) Fail to reject the null hypothesis that the populations have the same median. There is not sufficient evidence to support the claim that subjects with medium lead levels have full IQ scores with a higher median than the median full IQ score for subjects with high lead levels. It does not appear that lead level affects full IQ scores.
11. $R_1 = 2420$, $R_2 = 820$, $\mu_R = 1620$, $\sigma_R = 103.923$, test statistic: $z = 7.70$. Critical values: $z = \pm 1.96$. (Tech: P-value $= 0.0000$.) Reject the null hypothesis that the populations have the same median. It appears that the design of quarters changed in 1964.
13. Using $U = 86.5$, we get $z = -1.26$. The test statistic is the same value with opposite sign.