

Section 8-3

1. The P -value method and the critical value method always yield the same conclusion. The confidence interval method might or might not yield the same conclusion obtained by using the other two methods.
3. P -value: 0.00000000550. Because the P -value is so low, we have sufficient evidence to support the claim that $p < 0.5$.
5. a. Left-tailed. b. $z = -1.94$
c. P -value: 0.0260 (rounded)
d. $H_0: p = 0.1$. Reject the null hypothesis.
e. There is sufficient evidence to support the claim that less than 10% of treated subjects experience headaches.
7. a. Two-tailed. b. $z = -0.82$ c. P -value: 0.4106
d. $H_0: p = 0.35$. Fail to reject the null hypothesis.
e. There is not sufficient evidence to warrant rejection of the claim that 35% of adults have heard of the Sony Reader.
9. $H_0: p = 0.25$. $H_1: p \neq 0.25$. Test statistic: $z = 0.67$. Critical values: $z = \pm 2.575$ (Tech: ± 2.576). P -value: 0.5028 (Tech: 0.5021). Fail to reject H_0 . There is not sufficient evidence to warrant rejection of the claim that 25% of offspring peas will be yellow.
11. $H_0: p = 0.5$. $H_1: p > 0.5$. Test statistic: $z = 1.90$. Critical value: $z = 1.645$. P -value: 0.0287 (Tech: 0.0290). Reject H_0 . There is sufficient evidence to support the claim that the majority of adults feel vulnerable to identify theft.
13. $H_0: p = 0.5$. $H_1: p > 0.5$. Test statistic: $z = 26.45$. Critical value: $z = 2.33$. P -value: 0.0001 (Tech: 0.0000). Reject H_0 . There is sufficient evidence to support the claim that the XSORT method is effective in increasing the likelihood that a baby will be a girl.
15. $H_0: p = 0.5$. $H_1: p \neq 0.5$. Test statistic: $z = -2.03$. Critical values: $z = \pm 1.645$. P -value: 0.0424 (Tech: 0.0422). Reject H_0 . There is sufficient evidence to warrant rejection of the claim that touch therapists use a method equivalent to random guesses. However, their success rate of 123/280 (or 43.9%) indicates that they performed *worse* than random guesses, so they do not appear to be effective.
17. $H_0: p = 1/3$. $H_1: p < 1/3$. Test statistic: $z = -2.72$. Critical value: $z = -2.33$. P -value: 0.0033. Reject H_0 . There is sufficient evidence to support the claim that fewer than 1/3 of the challenges are successful. Players don't appear to be very good at recognizing referee errors.
19. $H_0: p = 0.000340$. $H_1: p \neq 0.000340$. Test statistic: $z = -0.66$. Critical values: $z = \pm 2.81$. P -value: 0.5092 (Tech: 0.5122). Fail to reject H_0 . There is not sufficient evidence to support the claim that the rate is different from 0.0340%. Cell phone users should not be concerned about cancer of the brain or nervous system.
21. $H_0: p = 0.5$. $H_1: p \neq 0.5$. Test statistic: $z = 2.75$. Critical values: $z = \pm 1.96$. P -value: 0.0060 (Tech: 0.0059). Reject H_0 . There is sufficient evidence to warrant rejection of the claim that the coin toss is fair in the sense that neither team has an advantage by winning it. The coin toss rule does not appear to be fair.
23. $H_0: p = 0.5$. $H_1: p < 0.5$. Test statistic: $z = -3.90$. Critical value: $z = -2.33$. P -value: 0.0001 (Tech: 0.0000484). Reject H_0 . There is sufficient evidence to support the claim that fewer than half of smartphone users identify the smartphone as the only thing they could not live without. Because only smartphone users were surveyed, the results do not apply to the general population.
25. $H_0: p = 0.25$. $H_1: p > 0.25$. Test statistic: $z = 1.91$ (using $\hat{p} = 0.29$) or $z = 1.93$ (using $x = 124$). Critical value: $z = 1.645$ (assuming a 0.05 significance level). P -value: 0.0281 (using $\hat{p} = 0.29$) or 0.0268 (using $x = 124$) (Tech P -value: 0.0269). Reject H_0 . There is sufficient evidence to support the claim that more than 25% of women purchase books online.
27. $H_0: p = 3/4$. $H_1: p > 3/4$. Test statistic: $z = 7.85$ (using $\hat{p} = 0.9$) or $z = 7.89$ (using $x = 463$). Critical value: $z = 2.33$. P -value: 0.0001 (Tech: 0.0000). Reject H_0 . There is sufficient evidence to support the claim that more than 3/4 of all human resource professionals say that the appearance of a job applicant is most important for a good first impression.
29. $H_0: p = 0.791$. $H_1: p < 0.791$. Test statistic: $z = -29.09$ (using $\hat{p} = 0.39$) or $z = -29.11$ (using $x = 339$). Critical value: $z = -2.33$. P -value: 0.0001 (Tech: 0.0000). Reject H_0 . There is sufficient evidence to support the claim that the percentage of selected Americans of Mexican ancestry is less than 79.1%, so the jury selection process appears to be unfair.
31. $H_0: p = 0.75$. $H_1: p > 0.75$. Test statistic: $z = 7.30$. Critical value: $z = 2.33$. P -value: 0.0001 (Tech: 0.0000). Reject H_0 . There is sufficient evidence to support the claim that more than 75% of television sets in use were tuned to the Super Bowl.
33. Among 100 M&Ms, 19 are green. $H_0: p = 0.16$. $H_1: p \neq 0.16$. Test statistic: $z = 0.82$. Critical values: $z = \pm 1.96$. P -value: 0.4122 (Tech: 0.4132). Fail to reject H_0 . There is not sufficient evidence to warrant rejection of the claim that 16% of plain M&M candies are green.
35. $H_0: p = 0.5$. $H_1: p > 0.5$. Using the binomial probability distribution with an assumed proportion of $p = 0.5$, the probability of 7 or more heads is 0.0352, so the P -value is 0.0352. Reject H_0 . There is sufficient evidence to support the claim that the coin favors heads.
37. a. 0.7224 (Tech: 0.7219)
b. 0.2776 (Tech: 0.2781)
c. The power of 0.7224 shows that there is a reasonably good chance of making the correct decision of rejecting the false null hypothesis. It would be better if the power were even higher, such as greater than 0.8 or 0.9.

Section 8-4

1. The requirements are (1) the sample must be a simple random sample, and (2) either or both of these conditions must be satisfied: The population is normally distributed or $n > 30$. There is not enough information given to determine whether the sample is a simple random sample. Because the sample size is not greater than 30, we must check for normality, but the value of 583 sec appears to be an outlier, and a normal quantile plot or histogram suggests that the sample does not appear to be from a normally distributed population.
3. A t test is a hypothesis test that uses the Student t distribution, such as the method of testing a claim about a population mean as presented in this section. The t test methods are much more likely to be used than the z test methods because the t test does not require a known value of σ , and realistic hypothesis tests of claims about μ typically involve a population with an unknown value of σ .
5. P -value < 0.005 (Tech: 0.0013).