

10.  $H_0: \mu = 1000$  HIC.  $H_1: \mu < 1000$  HIC. Test statistic:  $t = -10.177$ . Critical value:  $t = -3.747$ .  $P$ -value  $< 0.005$  (Tech: 0.0003). Reject  $H_0$ . There is sufficient evidence to support the claim that the population mean is less than 1000 HIC. The results suggest that the population mean is less than 1000 HIC, so they appear to satisfy the specified requirement.

### Chapter 8: Cumulative Review Exercises

- a. 53.3 words    b. 52.0 words    c. 15.7 words  
d. 245.1 words<sup>2</sup>    e. 45 words
- a. Ratio.    b. Discrete.  
c. The sample is a simple random sample if it was selected in such a way that all possible samples of the same size have the same chance of being selected.
- 42.1 words  $< \mu < 64.5$  words
- $H_0: \mu = 48.0$  words.  $H_1: \mu > 48.0$  words. Test statistic:  $t = 1.070$ . Critical value:  $t = 1.833$ .  $P$ -value  $> 0.10$  (Tech: 0.1561). Fail to reject  $H_0$ . There is not sufficient evidence to support the claim that the mean number of words on a page is greater than 48.0. There is not enough evidence to support the claim that there are more than 70,000 words in the dictionary.
- a. 2.28%    b. 38.9 in.    c. 0.9236 (Tech: 0.9234)
- a. 0.00195. It is unlikely because the probability of the event occurring is so small.  
b. 0.0121    c. 0.487
- No. The distribution is very skewed. A normal distribution would be approximately bell-shaped, but the displayed distribution is very far from being bell-shaped.
- Because the vertical scale starts at 7000 and not at 0, the difference between the number of males and the number of females is exaggerated, so the graph is deceptive by creating the wrong impression that there are many more male graduates than female graduates.
- a. 373    b.  $34.2\% < p < 40.2\%$   
c. Yes. With test statistic  $z = -8.11$  and with a  $P$ -value close to 0, there is sufficient evidence to support the claim that less than 50% of adults answer "yes."  
d. The required sample size depends on the confidence level and the sample proportion, not the population size.
- $H_0: p = 0.5$ .  $H_1: p < 0.5$ . Test statistic:  $z = -8.11$ . Critical value:  $z = -2.33$ .  $P$ -value: 0.0001 (Tech: 0.0000). Reject  $H_0$ . There is sufficient evidence to support the claim that fewer than 50% of Americans say that they have a gun in their home.
- Test statistic:  $z = -12.39$  (rounded). The  $P$ -value of  $3.137085E^{-35}$  is 0.0000 when rounded to four decimal places. There is sufficient evidence to warrant rejection of the claim that the vaccine has no effect.
- a.  $H_0: p_1 = p_2$ .  $H_1: p_1 > p_2$ . Test statistic:  $z = 6.44$ . 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 proportion of people over 55 who dream in black and white is greater than the proportion for those under 25.  
b. 98% CI:  $0.117 < p_1 - p_2 < 0.240$ . Because the confidence interval limits do not include 0, it appears that the two proportions are not equal. Because the confidence interval limits include only positive values, it appears that the proportion of people over 55 who dream in black and white is greater than the proportion for those under 25.  
c. The results suggest that the proportion of people over 55 who dream in black and white is greater than the proportion for those under 25, but the results cannot be used to verify the cause of that difference.
- a.  $H_0: p_1 = p_2$ .  $H_1: p_1 > p_2$ . Test statistic:  $z = 6.11$ . Critical value:  $z = 1.645$ .  $P$ -value: 0.0001 (Tech: 0.0000). Reject  $H_0$ . There is sufficient evidence to support the claim that the fatality rate is higher for those not wearing seat belts.  
b. 90% CI:  $0.00556 < p_1 - p_2 < 0.0122$ . Because the confidence interval limits do not include 0, it appears that the two fatality rates are not equal. Because the confidence interval limits include only positive values, it appears that the fatality rate is higher for those not wearing seat belts.  
c. The results suggest that the use of seat belts is associated with lower fatality rates than not using seat belts.
- a.  $H_0: p_1 = p_2$ .  $H_1: p_1 \neq p_2$ . Test statistic:  $z = 0.57$ . Critical values:  $z = \pm 1.96$ .  $P$ -value: 0.5686 (Tech: 0.5720). Fail to reject  $H_0$ . There is not sufficient evidence to support the claim that echinacea treatment has an effect.  
b. 95% CI:  $-0.0798 < p_1 - p_2 < 0.149$ . Because the confidence interval limits do contain 0, there is not a significant difference between the two proportions. There is not sufficient evidence to support the claim that echinacea treatment has an effect.  
c. Echinacea does not appear to have a significant effect on the infection rate. Because it does not appear to have an effect, it should not be recommended.
- a.  $H_0: p_1 = p_2$ .  $H_1: p_1 \neq p_2$ . Test statistic:  $z = 0.40$ . Critical values:  $z = \pm 1.96$ .  $P$ -value: 0.6892 (Tech: 0.6859). Fail to reject  $H_0$ . There is not sufficient evidence to warrant rejection of the claim that men and women have equal success in challenging calls.  
b. 95% CI:  $-0.0318 < p_1 - p_2 < 0.0484$ . Because the confidence interval limits contain 0, there is not a significant difference between the two proportions. There is not sufficient evidence to warrant rejection of the claim that men and women have equal success in challenging calls.  
c. It appears that men and women have equal success in challenging calls.

## Chapter 9 Answers

### Section 9-2

- The samples are simple random samples that are independent. For each of the two groups, the number of successes is at least 5 and the number of failures is at least 5. (Depending on what we call a success, the four numbers are 33, 115, 201,229 and 200,745 and all of those numbers are at least 5.) The requirements are satisfied.
- a.  $H_0: p_1 = p_2$ .  $H_1: p_1 < p_2$ .  
b. If the  $P$ -value is less than 0.001 we should reject the null hypothesis and conclude that there is sufficient evidence to support the claim that the rate of polio is less for children given the Salk vaccine than it is for children given a placebo.