8.10: Chapter 8 Solutions

1. two proportions

3. matched or paired samples

5. single mean

7. independent group means

9. two proportions

11. independent group means

13. independent group means

15. two proportions

17. The random variable is the difference between the mean amounts of sugar in the two soft drinks.

19. means

21. two-tailed

23. the difference between the mean life spans of whites and nonwhites

25. This is a comparison of two population means with unknown population standard deviations.

27. Check student's solution.

28.

1. Reject the null hypothesis
2. p-value < 0.05
3. There is not enough evidence at the 5% level of significance to support the claim that life expectancy in the 1900s is different between whites and nonwhites.

31. $P'_{OS1} - P'_{OS2}$ = difference in the proportions of phones that had system failures within the first eight hours of operation with OS_1 and OS_2.

34. proportions

36. right-tailed

38. The random variable is the difference in proportions (percents) of the populations that are of two or more races in Nevada and North Dakota.

40. Our sample sizes are much greater than five each, so we use the normal for two proportions distribution for this hypothesis test.

42.

1. Reject the null hypothesis.
2. p-value < alpha
3. At the 5% significance level, there is sufficient evidence to conclude that the proportion (percent) of the population that is of two or more races in Nevada is statistically higher than that in North Dakota.

44. the mean difference of the system failures

46.

a. 99% confidence interval = [-6.17, 0.17]. Fail to reject the null hypothesis, because 0 is contained within the CI. Interpretation of CI: We're 99% confident that, after installing the software patch, there were on average between 6.17 fewer and 0.17 more system failures.
b. $t_{critical}$ = -2.998; t_{obs} = -3.31. Reject the null hypothesis, because t_{obs} exceeds $t_{critical}$.
c. In the row for 7 *df*, the closest *t*-values to our t_{obs} of -3.31 are 2.998 and 3.499, so our *p*-value must fall between .005 and .01. Interpretation of *p*-value: Assuming there truly are more or an equal number of system failures after installing the patch compared to before installation, there is between .5% and 1% chance that we'd observe our sample mean difference of -3.

50. $H_0 : \mu_d \geq 0$; $H_a : \mu_d < 0$

52.

a. 99% confidence interval = [-3.75, 1.75]. Fail to reject the null hypothesis, because 0 is contained within the CI. Interpretation of CI: We're 99% confident that average blood pressure after 12 weeks on the medication was between 3.75 points lower and 1.75 points higher, compared to before taking the medication.
b. $t_{critical}$ = -3.365; t_{obs} = -1.34. Fail to reject the null hypothesis, because t_{obs} doesn't exceed $t_{critical}$.
c. In the row for 5 *df*, the closest *t*-value to our t_{obs} of -1.34 is (-)1.476, so our *p*-value must be greater than .10. Interpretation of *p*-value: Assuming there really were a decrease in blood pressure after 12 weeks on the medication, there is a large chance (over 10%) that we'd observe our sample mean difference of a 1 point decrease in blood pressure.

54.

a. $H_a : \mu_{4-year} > \mu_{2-year}$; $H_0 : \mu_{4-year} \leq \mu_{2-year}$
b. 95% confidence interval = [-2807.57, 3603.57]. Fail to reject the null hypothesis, because 0 is contained within the CI. Interpretation of CI: We're 95% confident that four-year colleges enroll an average of between 2807.57 fewer and 3603.57 more students than 2-year colleges do.
c. $t_{critical}$ = 1.671; t_{obs} = 0.25. Fail to reject the null hypothesis, because t_{obs} does not exceed $t_{critical}$.
d. In the row for 60 *df* (closest available in our table to 69 *df*), the closest *t*-value to our t_{obs} of 0.25 is 1.296, so our *p*-value must be more than .10. Interpretation of *p*-value: Assuming that 2-year colleges really enroll more or equal numbers of students than 4-year colleges, there is over a 10% chance that we'd observe our sample mean difference of 398 students.

56.

a. $H_a : \mu_{mechanical} < \mu_{electrical}$; $H_0 : \mu_{mechanical} \geq \mu_{electrical}$
b. 95% confidence interval = [-$2031.54, $831.54]. Fail to reject the null hypothesis, because 0 is contained within the CI. Interpretation of CI: We're 95% confident that entry-level mechanical engineers' average salary is between $2031.54 less and $831.54 more than that of entry-level electrical engineers.
c. $t_{critical}$ = -1.645; t_{obs} = -0.82. Fail to reject the null hypothesis, because t_{obs} does not exceed $t_{critical}$.
d. In the row for infinite *df*, the closest *t*-value to our t_{obs} of -0.82 is (-)1.282, so our *p*-value must be more than .10. Interpretation of *p*-value: Assuming that the mean salary of mechanical engineers is really more than or equal to that of electrical engineers, there's a good chance (over 10%) that we'd observe the data we did - a mean salary difference of $600.
e. *d* = -.16. This is a small effect.

59. c

61.

a. $H_a : \mu_{CA} < \mu_{US}$; $H_0 : \mu_{CA} \geq \mu_{US}$
b. 99% confidence interval = [-4.38, .38]. Fail to reject the null hypothesis, because 0 is contained within the CI. Interpretation of CI: We're 99% confident that the mean age of entering prostitution in Canada is between 4.38 years lower and .38 years higher than it is in the United States.
c. $t_{critical}$ = -2.326; t_{obs} = -2.166. Fail to reject the null hypothesis, because t_{obs} does not exceed $t_{critical}$.
d. In the row for infinite *df*, the closest *t*-values to our t_{obs} of -2.166 are (-)1.96 and (-)2.326, so our *p*-value must be between .01 and .025. Interpretation of *p*-value: Assuming that the mean age of entering prostitution is really higher or equal in the US compared to Canada, there is only a 1-2.5% chance that we'd observe our sample's mean difference of 2 years.
e. *d* = -.28. This is a medium-sized effect.

63. d

65.

a. $H_a : P_W \neq P_B$; $H_0 : P_W = P_B$
b. 95% confidence interval = [-.0327, .0399]. Fail to reject the null hypothesis, because 0 is contained within the CI. Interpretation of CI: We're 95% confident that the proportion of Black female suicide victims aged 15-24 is between 3.27% lower and 3.99% higher than the proportion of White female suicide victims.

67.

a. $H_a : P_{CabrilloCollege} \neq P_{LakeTahoeCollege}$; $H_0 : P_{CabrilloCollege} = P_{LakeTahoeCollege}$

b. 95% confidence interval = [.0201, .0499]. Reject the null hypothesis, because 0 is not included in the CI. Interpretation of CI: We're 95% confident that the percentage of Hispanic students at Cabrillo College is between 2.01% and 4.99% higher than it is at Lake Tahoe College.

69. a

70.

a. $H_a : P_{16-29} \neq P_{30+}$; $H_0 : P_{16-29} = P_{30+}$
b. 90% confidence interval = [.0201, .0599]. Reject the null hypothesis, because 0 is not included in the CI. Interpretation of CI: We're 90% confident that the percentage of 30+ year olds who use eReaders is between 2.01% and 5.99% higher than the percentage of 16-29 year olds who use eReaders.

72.

a. $H_a : P_{16-29} > P_{30+}$; $H_0 : P_{16-29} \leq P_{30+}$
b. 99% confidence interval = [-.0260, .0460]. Do not reject the null hypothesis, because 0 is included in the CI. Interpretation of CI: We're 99% confident that the percentage of 16-29 year olds who use tablets is between 2.60% lower and 4.60% higher than the percentage of 30+ year olds who use tablets.

74.

a. $H_a : P_{men} > P_{women}$; $H_0 : P_{men} \leq P_{women}$
b. 95% confidence interval = [-.098, .278]. Do not reject the null hypothesis, because 0 is included in the CI. Interpretation of CI: We're 95% confident that the percentage of men who enjoy shopping for electronics is between 9.8% lower and 27.8% higher than the percentage of women who enjoy shopping for electronics.

76.

a. $H_a : P_{males} < P_{females}$; $H_0 : P_{males} \geq P_{females}$
b. 95% confidence interval = [-.16, .06]. Do not reject the null hypothesis, because 0 is included in the CI. Interpretation of CI: We're 95% confident that the percentage of college-age males with at least one pierced ear is between 16% less and 6% more than the percentage of college-age females with at least one pierced ear.

77.

a. $H_a : \mu_{after} < \mu_{before}$; $H_0 : \mu_{after} \geq \mu_{before}$
b. 95% confidence interval = [-27.84, 7.84]. Fail to reject the null hypothesis, because 0 is contained within the CI. Interpretation of CI: We're 95% confident that the mean cholesterol level after dieting is between 27.84 points lower and 7.84 points higher than it was beforehand.
c. $t_{critical}$ = -1.833; t_{obs} = -1.27. Fail to reject the null hypothesis, because t_{obs} does not exceed $t_{critical}$.
d. In the row for 9 *df*, the closest *t*-value to our t_{obs} of -1.27 is (-)1.383, so our *p*-value must be more than .10. Interpretation of *p*-value: Assuming that cholesterol levels really increase or remain the same on this diet, there's more than a 10% chance that we'd get our sample mean change in cholesterol levels of -10.

80.

a. $H_a : \mu_{2013} > \mu_{2012}$; $H_0 : \mu_{2013} \leq \mu_{2012}$
b. 95% confidence interval = [88.45, 261.55]. We can reject the null hypothesis, because 0 isn't contained within the CI. Interpretation of CI: We're 95% confident that there were an average of 88.45 and 261.55 more new female breast cancer cases in the south in 2013, compared to 2012.
c. $t_{critical}$ = 1.782; t_{obs} = 4.41. Reject the null hypothesis, because t_{obs} exceeds $t_{critical}$.
d. In the row for 12 *df*, the closest *t*-value to our t_{obs} of 4.41 is 3.930, so our *p*-value must be less than .001. Interpretation of *p*-value: Assuming that the number of new female breast cancer cases really increased or remained equal from 2012 to 2013, there's less than a 0.1% chance that we'd observe our sample mean increase in cases of 175.

81.

a. $H_a : \mu_{Hyatt} \neq \mu_{Hilton}$; $H_0 : \mu_{Hyatt} = \mu_{Hilton}$
b. 99% confidence interval = [-$81.90, $63.90]. We cannot reject the null hypothesis, because 0 is included within the CI. Interpretation of CI: We're 99% confident that Hilton prices, on average, are between $81.90 lower and $63.90 higher than Hyatt prices in the same cities.

c. $t_{critical}$ = ±3.250; t_{obs} = -.40. Do not reject the null hypothesis, because t_{obs} does not exceed $t_{critical}$.
d. In the row for 9 *df*, the closest *t*-value to our t_{obs} of -.40 is (-)1.383, so our *p*-value must be more than .10 x 2 (because we have a two-tailed hypothesis), or .20. Interpretation of *p*-value: Assuming that Hilton and Hyatt prices (within in the same cities) truly differ from each other, there's over a 20% chance that we'd observe our sample mean price difference of $9.

84. d

86. c

88. e

90. d

92. e

94. a
