15. a. H_0: $p_1 = p_2$. H_1: $p_1 > p_2$. Test statistic: $z = 9.97$. 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 cure rate with oxygen treatment is higher than the cure rate for those given a placebo. It appears that the oxygen treatment is effective.
    b. 98% CI: $0.467 < p_1 - p_2 < 0.687$. Because the confidence interval limits do not include 0, it appears that the two cure rates are not equal. Because the confidence interval limits include only positive values, it appears that the cure rate with oxygen treatment is higher than the cure rate for those given a placebo. It appears that the oxygen treatment is effective.
    c. The results suggest that the oxygen treatment is effective in curing cluster headaches.
17. a. H_0: $p_1 = p_2$. H_1: $p_1 < p_2$. Test statistic: $z = -1.17$. Critical value: $z = -2.33$. P-value: 0.1210 (Tech: 0.1214). Fail to reject H_0. There is not sufficient evidence to support the claim that the rate of left-handedness among males is less than that among females.
    b. 98% CI: $-0.0849 < p_1 - p_2 < 0.0265$ (Tech: $-0.0848 < p_1 - p_2 < 0.0264$). Because the confidence interval limits include 0, there does not appear to be a significant difference between the rate of left-handedness among males and the rate among females. There is not sufficient evidence to support the claim that the rate of left-handedness among males is less than that among females.
    c. The rate of left-handedness among males does not appear to be less than the rate of left-handedness among females.
19. a. $0.0227 < p_1 - p_2 < 0.217$; because the confidence interval limits do not contain 0, it appears that $p_1 = p_2$ can be rejected.
    b. $0.491 < p_1 < 0.629$; $0.371 < p_2 < 0.509$; because the confidence intervals do overlap, it appears that $p_1 = p_2$ cannot be rejected.
    c. H_0: $p_1 = p_2$. H_1: $p_1 \neq p_2$. Test statistic: $z = 2.40$. P-value: 0.0164. Critical values: $z = \pm 1.96$. Reject H_0. There is sufficient evidence to reject $p_1 = p_2$.
    d. Reject $p_1 = p_2$. Least effective: Using the overlap between the individual confidence intervals.
21. 3383 (Tech: 3382)

Section 9-3

1. Independent: b, d, e
3. Because the confidence interval does not contain 0, it appears that there is a significant difference between the mean height of women and the mean height of men. Based on the confidence interval, it appears that the mean height of men is greater than the mean height of women.
5. a. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 \neq \mu_2$. Test statistic: $t = -2.979$. Critical values: $t = \pm 2.032$ (Tech: ± 2.002). P-value < 0.01 (Tech: 0.0042). Reject H_0. There is sufficient evidence to warrant rejection of the claim that the samples are from populations with the same mean. Color does appear to have an effect on creativity scores. Blue appears to be associated with higher creativity scores.
    b. 95% CI: $-0.98 < \mu_1 - \mu_2 < -0.18$ (Tech: $-0.97 < \mu_1 - \mu_2 < -0.19$)
7. a. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 > \mu_2$. Test statistic: $t = 0.132$. Critical value: $t = 1.729$. P-value > 0.10 (Tech: 0.4480). Fail to reject H_0. There is not sufficient evidence to support the claim that the magnets are effective in reducing pain. It is valid to argue that the magnets might appear to be effective if the sample sizes are larger.
    b. 90% CI: $-0.61 < \mu_1 - \mu_2 < 0.71$ (Tech: $-0.59 < \mu_1 - \mu_2 < 0.69$)
9. a. The sample data meet the loose requirement of having a normal distribution. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 > \mu_2$. Test statistic: $t = 0.852$. Critical value: $t = 2.426$ (Tech: 2.676). P-value > 0.10 (Tech: 0.2054). Fail to reject H_0. There is not sufficient evidence to support the claim that men have a higher mean body temperature than women.
    b. 98% CI: $-0.54°\text{F} < (\mu_1 - \mu_2) < 1.02°\text{F}$ (Tech: $-0.51°\text{F} < (\mu_1 - \mu_2) < 0.99°\text{F}$)
11. a. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 < \mu_2$. Test statistic: $t = -3.547$. Critical value: $t = -2.462$ (Tech: -2.392). P-value < 0.005 (Tech: 0.0004). Reject H_0. There is sufficient evidence to support the claim that the mean maximal skull breadth in 4000 B.C. is less than the mean in A.D. 150.
    b. 98% CI: -8.13 mm $< \mu_1 - \mu_2 < -1.47$ mm (Tech: -8.04 mm $< (\mu_1 - \mu_2) < -1.56$ mm)
13. a. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 < \mu_2$. Test statistic: $t = -3.142$. Critical value: $t = -2.462$ (Tech: -2.403). P-value < 0.005 (Tech: 0.0014). Reject H_0. There is sufficient evidence to support the claim that students taking the nonproctored test get a higher mean than those taking the proctored test.
    b. 98% CI: $-25.54 < \mu_1 - \mu_2 < -3.10$ (Tech: $-25.27 < (\mu_1 - \mu_2) < -3.37$)
15. a. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 \neq \mu_2$. Test statistic: $t = 1.274$. Critical values: $t = \pm 2.023$ (Tech: ± 1.994). P-value > 0.20 (Tech: 0.2066). Fail to reject H_0. There is not sufficient evidence to warrant rejection of the claim that males and females have the same mean BMI.
    b. 95% CI: $-1.08 < \mu_1 - \mu_2 < 4.76$ (Tech: $-1.04 < \mu_1 - \mu_2 < 4.72$)
17. a. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 > \mu_2$. Test statistic: $t = 0.089$. Critical value: $t = 1.725$ (Tech: 2.029). P-value > 0.10 (Tech: 0.4648.) Fail to reject H_0. There is not sufficient evidence to support the claim that the mean IQ score of people with medium lead levels is higher than the mean IQ score of people with high lead levels.
    b. 90% CI: $-5.9 < \mu_1 - \mu_2 < 6.6$ (Tech: $-5.8 < (\mu_1 - \mu_2) < 6.4$)
19. a. H_0: $\mu_1 = \mu_2$. H_1: $\mu_1 < \mu_2$. Test statistic: $t = -1.810$. Critical value: $t = -2.650$ (Tech: -2.574). P-value > 0.025 (Tech: 0.0442). Fail to reject H_0. There is not sufficient evidence to support the claim that the mean longevity for popes is less than the mean for British monarchs after coronation.
    b. 98% CI: -23.6 years $< (\mu_1 - \mu_2) < 4.4$ years (Tech: -23.2 years $< (\mu_1 - \mu_2) < 4.0$ years)