1. Question 11.22, page 475. Perform the tests here two-sided. Perform tests at the level .05 if not stated otherwise.

(10 pts) Let $\mu_1$ be the mean cholesterol level for suicide admittees, and let $\mu_2$ be the mean cholesterol level for other admittees. Test $H_0: \mu_1 = \mu_2$ vs. $H_A: \mu_1 \neq \mu_2$. Perform a test with significance level 5%. The estimated mean difference is $217 - 198 = 19$. The standard error of the mean difference is $\sqrt{\frac{20^2}{331} + \frac{24^2}{331}} = 1.717$. Degrees of freedom are $N - 1 = 639$.

The test statistic is $|\frac{19}{1.717}| = 11.065$. The p-value is 0. Reject Null Hypothesis. Suicide admittees differ from other admittees in their population mean cholesterol level.

Total for this question: 10.


(8 pts) Let $\mu_1$ be the population mean for group Few headers. Let $\mu_2$ be the population mean for group Many headers. Test $H_0: \mu_1 = \mu_2$ vs. $H_A: \mu_1 \neq \mu_2$. Perform a test with significance level 5%. The estimated mean difference is $103 - 112 = -9$. The standard error of the mean difference is $\sqrt{\frac{10^2}{35} + \frac{8^2}{25}} = 2.327$. The degrees of freedom are $N - 1 = 57$. The test statistic is $|\frac{-9}{2.327}| = 3.867$. The p-value is 0.0003. Reject $H_0$.

Note that association does not imply causation. You could only get causation if the split between many and few headers was done randomly. Otherwise these results are consistent with the hypothesis that smart players avoid headers.

Total for this question: 8.

3. Question 11.40, page 487. Perform the tests here two-sided. Perform tests at the level .05 if not stated otherwise.

(10 pts) Note that this is a paired comparison. Degrees of freedom are $N - 1 = 321$. The test standard error of the statistic is 0.638. The test statistic is $|\frac{5.15}{0.638}| = 8.071$. The p-value is 0. Reject Null Hypothesis. The evidence is sufficient to demonstrate a true mean change in weight.

Total for this question: 10.

4. Question 11.42, page 494f. Let $\pi_1$ be the proportion of individuals in non-recirculating airplanes with respiratory symptoms. Let $\pi_2$ be the proportion of individuals in recirculating airplanes with respiratory symptoms. Test the null hypothesis $H_0: \pi_1 = \pi_2$, vs. the alternative $H_A: \pi_1 \neq \pi_2$. (You know you should use the two-sided alternative, since the effect you’re looking for is described as a difference, without reference to which group should do worse.) So $\pi_c = \frac{(108 + 111)/(517 + 583) = .199}$, and

$$z = \frac{108/517 - 111/583}{\sqrt{(219/1100) \times (881/1100)/517 + (219/1100) \times (881/1100)/583} = 0.0242 = 0.767}$$

The p-value is $2 \times .2206 = .4412$. Do not reject the null hypothesis.

Total for this question: 0.
(9 pts) Let $\pi_1$ be the population proportion for group DARE students. Let $\pi_2$ be the population proportion for group non-DARE students. Test $H_0 : \pi_1 = \pi_2$ vs $H_A : \pi_1 < \pi_2$. Perform a test with significance level 5%. The estimated proportion difference is $\frac{181}{335} - \frac{141}{288} = 0.54 - 0.49 = 0.05$. The common proportion is $\hat{\pi}_c = \frac{181 + 141}{335 + 288} = 0.517$, and the test standard error of the statistic is $\sqrt{0.517 \times \frac{0.483}{335} + 0.517 \times \frac{0.483}{288}} = 0.04$. The test statistic is $|0.05/0.04| = 1.246$. The $p$-value is 0.1063. Do not reject $H_0$. Evidence is not sufficient to demonstrate that DARE is effective.

Total for this question: 9.

6. Question 11.66, page 510. Perform the tests here two-sided. Also give a confidence interval for the mean difference in game scores.
(10 pts) Let $\mu_1$ be the population mean for group Gretzky games. Let $\mu_2$ be the population mean for group Non-Gretzky games. Test $H_0 : \mu_1 = \mu_2$ vs $H_A : \mu_1 \neq \mu_2$. Perform a test with significance level 5%. The estimated mean difference is $3.88 - 4.73 = -0.85$. The standard error of the mean difference is $\sqrt{\frac{1.29^2}{41} + \frac{1.18^2}{17}} = 0.35$. The degrees of freedom are 32. The 95% confidence interval for $\mu_2 - \mu_1$ is $-0.85 \pm 2.037 \times 0.35 = -0.85 \pm 0.713 = (-1.563, -0.137)$. The test statistic is $|0.05/0.04| = 2.429$. The $p$-value is 0.021. Do not reject the Null Hypothesis. We do not have sufficient evidence to conclude that games with Gretzky playing had a population mean score different from those in which Gretzky did not play.

Total for this question: 10.

(10 pts) Let $\mu_1$ be the population mean for Males. Let $\mu_2$ be the population mean for Females. The estimated mean difference is $1843 - 2127 = -284$. The standard error of the mean difference is $\sqrt{\frac{513^2}{13} + \frac{446^2}{14}} = 185.613$. The degrees of freedom are 23. The 95% confidence interval for $\mu_2 - \mu_1$ is $-284 \pm 2.069 \times 185.613 = -284 \pm 383.97 = (-667.969, 99.969)$. Hence with 95% confidence, the interval $(-667.969, 99.969)$ contains the true value of population mean value for women minus population mean value for men.