

IEOR 3600: HMWK 8

1. *Estimating the difference between two proportions*: It is thought that people in California are more likely to support a certain environmental law than people in New York. A random sample of 1000 Californians yields 375 of them that support the law (hence a proportion of $\bar{p}_1(n_1) = 0.375$), while a random sample of 750 New Yorkers yields 220 of them that support the law (hence a proportion of $\bar{p}_2(n_2) = 0.293$). Letting p_1 and p_2 denote the real (unknown) proportions, compute a 95% confidence interval for the difference $p_1 - p_2$. Is there a significant difference?
2. χ^2 : Chapter 8: Page 276-277; 38—41 (use Table on Page 714, for example).
3. χ^2 : A testing center for undergraduates says that the test scores on an entrance exam are normally distributed with mean $\mu = 74$ and variance $\sigma^2 = 8$. You wish to check whether $\sigma^2 = 8$ is realistic. So you go out and randomly sample 20 undergraduate students. We know that (due to the normality),

$$\chi^2 = \frac{19s^2(20)}{\sigma^2}$$

has a χ^2 distribution with 19 degrees of freedom. And thus if $\sigma^2 = 8$, then

$$\chi^2 = \frac{19s^2(20)}{8}$$

has a χ^2 distribution with 19 degrees of freedom. Your sample yields $s^2(20) = 20$. Using this sample, do you believe the claim that $\sigma^2 = 8$?

4. *Hypothesis testing for a proportion* : Two candidates A, B are running for office. B claims that the race is a dead heat, that is, that the true current proportion for each candidate is $p = 0.50$. Candidate A , however, disagrees, he thinks he is currently ahead. A pollster polls a randomly selected group of $n = 1000$ people and finds that 535 prefer A (hence $\hat{p}(n) = 0.535$). At the 95% confidence level, using the null hypothesis $H_0 : p = 0.50$ versus the alternative $H_1 : p > 0.50$, would you reject the “dead heat” claim and conclude that A is ahead?
5. Chapter 9 (here we are assuming that the samples are from a normal distribution with known σ^2): Page 313-314; 29—31, 33,34,35,36.
6. A winery claims that the alcohol content of its red wine is (on average) $\mu = 0.13$ (e.g., 13%.) 100 randomly selected bottles are sampled and the sample average is 0.142 with a sample variance of $s^2(n) = 0.01$. Do a hypothesis test (using the normal Z , since $n = 100$ is large) of $H_0 : \mu = 0.13$ versus $H_1 : \mu \neq 0.13$ at the 95% confidence level. Do you reject H_0 ? What is the $P - value = P(|Z| > z_0)$? Redo if the sample size was $n = 400$.