

Problem Set #8

1. You have a random sample of 10,000 individuals in the labor force. Of these individuals, 400 report they are unemployed. The remainder report they are employed. Test the null hypothesis that the unemployment rate equals five percent against the alternative that the unemployment rate does not equal five percent. Use a five percent level of significance. Please be explicit about how you set up and construct the test. Hint: Set up the unemployment rate as the mean of a Bernoulli distribution, and rely on the asymptotic distribution of the sample mean for the hypothesis test. Use the sample variance in place of the population variance.
2. Assume you have the same sample results as in question #2. Suppose you believe an unemployment rate of less than five percent produces inflationary pressure on the economy. Therefore, you want to test whether the unemployment rate is less than five percent. Again, use a five percent level of significance and construct the relevant hypothesis test.
3. You have a random sample of a variable X , where X follows a normal distribution. The sample size is 100. From the sample, the sum of the draws of X equals 200, and the sum of the draws of X^2 equals 800. Create an exact 95 percent confidence interval for the mean of X .
4. Define a random variable X as a student's score on a standardized test. In the population, X follows a normal distribution. In a random sample of size 80, the sum of the students' scores equals 8,640, and the sum of the students' scores squared equals 995,840. Create an exact 95 percent confidence interval for the average test score in the population.
5. Using the setup for question #2, test the hypothesis that the average test score in the population equals 100 against the alternative that it does not equal to 100. Use a five percent level of significance for the hypothesis test.
6. A university is considering a change in the way students pay for their education. Presently, the students pay \$16 per credit hour. The university is contemplating charging each student a set fee of \$240 per quarter. Regardless of how many credit hours each takes. To see if this proposal would be economically feasible, the university would like to know how many credit hours, on the average, each student takes per quarter. A random sample of 250 students yields a mean of 14.1 credit hours per quarter and a standard deviation of 2.4 credit hours per quarter. Suppose the administration wants to estimate the mean within 0.1 credit hours at 98% reliability. How many students should the administration sample?