Data 88S

April 24, 2024

Chapter 10, Exercise 3

1. Let X have the exponential distribution with mean 24 hours. Assume that X is measured in hours.

   (a) Find $P(X > 72)$.

   (b) Find $P(X > 72 | X > 24)$

Chapter 10, Exercise 8

2. A simple random sample of 500 students is taken at University A. Independently, a simple random sample of 700 students is taken at University B. In the sample from University A, 20% of the students are Economics majors. In the sample from University B, 16% of the students are Economics majors.

   Is this difference due to chance? Or does University A have a higher percent of Economics majors?

   Answer this by performing a test of hypotheses at the 5% level. Your answer should include a null hypothesis in terms of random variables, an appropriate alternative hypothesis, a test statistic, a p-value, and a conclusion, along with justifications of all of these.

3. There is a company which makes batteries. To check the lifespan of their battery, the company randomly samples 10,000 batteries. The average lifespan of the batteries sampled was 6,000 days. It is known that the SD of the population of all batteries (σ) is 500 days. *(In this problem, you may use $\Phi(1.65) = 95\%, \Phi(1.96) = 97.5\%, \Phi(2.33) = 99\%, \text{ or } \Phi(2.58) = 99.5\%)$*

   (a) Recall chapter 5.4 of the textbook. If you have to estimate the (population) mean of the battery lifespan made by this company as a single value, what is your best answer?

   (b) The confidence interval is also a kind of estimate, but it has a form of an interval, not a value. Find a 95% confidence interval for the mean lifespan of a battery.

   (c) Find a 99% confidence interval for the mean lifespan of a battery.

   Chapter 10, Exercise 10

4. Let U have the uniform distribution on the interval (0, 1). Let $V = -\frac{1}{5}log(U)$.

   (a) What are the possible values of V?

   (b) Find the cdf of V. Be careful about minus signs and directions of inequalities. Section 10.2 has the cdf of U.

   (c) Use part (b) to identify the distribution of V.