

Statistics and Data Analysis, Fall 2016

Pre-lecture Problems 7

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Note 1. The deadline of submitting the pre-lecture problem (if you want) is **14:30, November 9, 2016**. Please submit a hard copy of your work to the instructor in class. Late submissions will not be accepted. Each student must submit her/his individual work. Submit **ONLY** the problem that counts for grades.

Note 2. Please make your answer as clear (i.e., easy to read) as possible. We reserve the right to take away points when the correctness cannot be easily determined (e.g., when the writing is messy and cannot be easily understood).

Note 3. If you do not make a submission, this set of pre-lecture problems will not be counted in your semester grades. If you do, this will be counted as an usual one.

1. (0 point) Consider the hypothesis introduced on page 14 of the slides.
 - (a) Show that the sample mean $\bar{X} \sim \text{ND}(1000, 20)$ if the null hypothesis is true.
 - (b) For $\bar{X} \sim \text{ND}(1000, 20)$, show that $\Pr(\bar{X} \leq 960.8) = 0.025$.
Hint. `NORM.DIST()`.
 - (c) Find d such that $\Pr(\bar{X} \leq d) = 0.005$. What does this value of d mean?
Hint. `NORM.INV()`.
 - (d) Let $\bar{x}_2 = 952$ be a realized value of the sample mean, find its p -value.
2. (0 point) I did not do well in the midterm exam and only got 30 points. When considering whether to drop this course, I am wondering how my classmates did. Dropping a course is not an easy decision, and I decide to do that if (and only if) the class average is above 70. Let μ be the class average, which is unknown to me. Write down the statistical hypothesis for me to test the class average.
3. (10 points) To understand the average amount of time an NTU student spends on physical exercises per week, a researcher randomly sampled 49 NTU students and recorded the numbers of hours each student spends. The sample mean is $\bar{x} = 2.3$ hours. Suppose that the population mean (i.e., the average amount of time an NTU student spends on physical exercises per week) μ is unknown but the population standard deviation σ is known to be 0.7. If it is concluded that μ is below 2, the researcher will give a public talk about how to exercise everyday.
 - (a) (3 points) Let $\mu_0 = 2$ be the hypothesized population mean. Write down the statistical hypothesis.
 - (b) (3 points) Find the p -value of $\bar{x} = 2.3$.
 - (c) (4 points) Let the confidence level be 95%, write down the conclusion of the test.