# Math 326 – Homework 06 (10.2 – 10.8)
## Due (via upload to Canvas) Wednesday, March 9, 2022 at 11:59 PM

1. Suppose that we want to study whether students enrolled in a campus wellness program get more sleep than the average college student. (This problem assumes that the wellness group comes from the same general population as the other college students.) Suppose that the average student gets 6.1 hours of sleep per day and denote $\mu$ denote the average sleep gotten by a student in the wellness population.

   (a) State the hypothesis test for the test you are designing.

   Assume the standard *deviation* is known as $\sigma = 0.5$ hour and that the underlying sleep distribution is normal and that there are 16 students in the wellness program. We define the rejection region to be $\bar{Y} > 6.3$.

   (b) Find $\alpha$, the probability of Type I error.

   (c) Find $\beta$, the probability of Type II error at $\mu = 6.3, 6.5$, and 6.7.

   (d) Sketch the power function for this test.

2. Lifetimes of certain brand of switch follows (approximately) a normal distribution with mean 100 hours. Five switches of a new brand are obtained and tested and their lifetimes measured to be 120, 101, 114, 95, and 130 hours. Does this provide strong evidence that the new switches have a longer average lifespan?

3. A federal regulatory agency hypothesises that the average length of a stay in the hospital is in excess of 5 days. A pilot data set had standard *deviation* of 3.1 days. Using this as the population standard error, how large a sample would you need in designing a test with $\alpha = 0.01$ and $\beta = 0.05$ if the true average is 5.5 days.

4. A study was performed to compare two cholesterol-reducing drugs. Observations of the number of units of cholesterol reduction were recorded for 12 subjects receiving Drug A and 14 subjects receiving Drug B:

   |                   | Drug A | Drug B |
   |-------------------|--------|--------|
   | $n$               | 12     | 14     |
   | Mean              | 5.64   | 5.03   |
   | stnd *deviation*  | 1.25   | 1.82   |

   Researchers are interested in testing if the drugs appear to be *different* in their average cholesterol reduction.

   (a) State the assumptions needed for the independent samples $t$ test to be valid.

   (b) Perform the $t$-test, find the $p$-value, and state the conclusion using a 5% significance level.