ECE 315 - INTRODUCTION TO STATISTICS - INVEST 24
COMPARING OF TWO POPULATIONS

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To do "well" on this investigation you must not only get the right answers but must also do neat, complete and concise writeups that make obvious what each problem is, how you're solving the problem and what your answer is. You also need to include drawings of all circuits as well as appropriate graphs and tables.

In the last Investigation on hypothesis testing we used hypothesis testing to determine whether a given $\mu = \mu_o$ was in all probability the mean of the population. In this Investigation we use hypothesis testing to "determine" whether or not two "populations" have the same mean.

1. We begin with a review problem. Would you accept or reject the null hypothesis $\mu = \mu_o = 100$ or the alternative hypothesis $\mu > \mu_o$ if $\overline{X} = 105$, $s^2 = 10$ and $n = 50$

2. Suppose a semiconductor company is considering some changes in an effort to improve its yield. Suppose that before implementing any changes we take a sample of $n_1 = 100$ wafers and obtain an average yield of $\overline{X}_1 = 20$ chips/wafer with sample variance $s_1^2 = 3$. And that a test run of the new method with a sample of $n_2 = 100$ wafers gives us an average yield of $\overline{X}_2 = 23$ chips/wafer with $s_2^2 = 4$

   a. What is the probability that the changes improve the yield. Hint - make use of the fact that

   $$X = \overline{X}_1 - \overline{X}_2$$

   is Gaussian with variance

   $$s^2 = \frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}$$

   Choose the null and alternative hypotheses as follows

   Null Hypothesis: $\mu_1 = \mu_2$

   Alternative Hypothesis: $\mu_1 < \mu_2$

   b. Would you invest in the changes

3. We now consider a similar but slightly different problem. Suppose 100 overweight engineering managers are put on a diet and that

   X = (starting weight) - (weight after 6 months)

   Suppose $\overline{X} = -14$ and $s = 4$. What is the probability that the diet leads to a loss of at least 10 pounds