

Math 1070-1, (Practice) Final Exam Spring 2003

This practice exam includes the material from the last third of the course only. The actual final exam is truly comprehensive.

The actual exam brochure includes a page of questions that includes a “formula sheet,” two pages of normal tables, and two pages of t -tables.

1. In order to find if, on average, men and women differ in height, a group took two independent samples of 100 men and 130 women each. The average male measured at 5'9", and the average female at 5'5", while the standard deviations were 5.5" and 4.8", respectively. Find a 90%-confidence interval for the average difference between men's and women's heights. You may need the fact that one foot is equal to twelve inches.
2. A simple random sample of 100 flights of airline 1 shows that 60 were on time. Another independent SRS of 150 flights for airline 2 shows that 75 were on time. We wish to know whether the two airlines are equally reliable.
 - (a) Carefully write your null and alternative hypotheses.
 - (b) Do a 94%-test of the hypothesis that you circled earlier. Compute the p-value, and report your findings (e.g., 'reject' or 'not reject'.)
 - (c) Find an 86%-confidence interval for the difference between the true proportions.
3. Thirty five Cheetahs¹ were sampled at random, and their top running speeds were recorded. The average speed in the sample was 59.526 mph, and the sample standard deviation was 3.2 mph. Assume that the speed distribution of the African Cheetah (named *Acinonyx jubatus*) is approximately normal.
 - (a) Write down your H_0 and H_a .
 - (b) What is the p-value of your test?
 - (c) Test the theory that the average speed of such Cheetahs is at least 60 mph. [Perform this test at the 95% level.]
4. The average retail price of bananas in 1998 was 51.0 cents per pound (U. S. Department of Agriculture, *Food Cost Review*). Recently, a random sample of 15 markets revealed the following banana prices per pound:

| | | | | |
|----|----|----|----|----|
| 56 | 53 | 55 | 53 | 50 |
| 57 | 58 | 54 | 48 | 47 |
| 50 | 57 | 57 | 51 | 55 |

Find a 99.2%-confidence interval for the true per-pound average price of bananas today.

Useful Formulas for CIs

¹The Cheetah Conservation of Southern Africa *Trade Environment Database*

- The CI for μ based on a Z :

$$\mu = \bar{X} \pm z^* \frac{\sigma}{\sqrt{n}}.$$

- The CI for μ based on a T :

$$\mu = \bar{X} \pm t^* \frac{s}{\sqrt{n}} \quad (\text{df} = n - 1).$$

- The CI for $\mu_1 - \mu_2$ based on a Z :

$$\mu_1 - \mu_2 = \bar{X}_1 - \bar{X}_2 \pm z^* \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}.$$

- The CI for $\mu_1 - \mu_2$ based on a T :

$$\mu_1 - \mu_2 = \bar{X}_1 - \bar{X}_2 \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}} \quad (\text{df} = \min(n_1 - 1, n_2 - 1)).$$

- Wilson's proportion: $\tilde{p} = \frac{X+2}{n+4}$. A CI for p :

$$p = \tilde{p} \pm z^* \sqrt{\frac{\tilde{p}(1-\tilde{p})}{n+4}}.$$

- Wilson proportions: $\tilde{p}_1 = \frac{X_1+1}{n_1+2}$, and $\tilde{p}_2 = \frac{X_2+1}{n_2+2}$. A CI for $p_1 - p_2$:

$$p_1 - p_2 = \tilde{p}_1 - \tilde{p}_2 \pm z^* \sqrt{\frac{\tilde{p}_1(1-\tilde{p}_1)}{n_1+2} + \frac{\tilde{p}_2(1-\tilde{p}_2)}{n_2+2}}.$$

Useful Formulas for Tests

- For the Z -test for $H_0 : \mu = \mu_0$,

$$Z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}}.$$

- For the T -test for $H_0 : \mu = \mu_0$,

$$Z = \frac{\bar{X} - \mu_0}{s/\sqrt{n}} \quad (\text{df} = n - 1).$$

- For the Z -test for $H_0 : \mu_1 - \mu_2 = 0$,

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}.$$

- For the T -test for $H_0 : \mu_1 - \mu_2 = 0$,

$$Z = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \quad (\text{df} = \min(n_1 - 1, n_2 - 1)).$$

- For the Z -test for $H_0 : p = p_0$,

$$Z = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0)/n}}.$$

- For the Z -test for $H_0 : p_1 = p_2$,

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p} \left[\frac{1}{n_1} + \frac{1}{n_2} \right]}}, \quad \text{where } \hat{p} = \frac{X_1 + X_2}{n_1 + n_2}.$$