# MATH 124 Spring 2005

# Lecture: 22 A
# Date: May 12, 2005

**Skills you should acquire from this lecture:**

- Problem solving skills for confidence intervals and Hypothesis testing for the population mean when sigma (the population standard deviation) is unknown.
- Problems 7.2, 7.4, 7.33, 7.36

problems where $\sigma$ is not known
7.2, 7.4, 7.33, 7.36

Problem 7.2 Let $\mu$ = mean one-bedroom apartment rent in this community

First lets find $\bar{x}$ and s

$\Sigma x = 5310$ $\quad$ $\Sigma x^2 = 2881300$

So $\bar{x} = \frac{5310}{10} = 531$ $\quad$ $s = \sqrt{\frac{2881300 - 10(531)^2}{9}}$

$= 82.79$

Since $n = 10$ $\quad$ $df = 10 - 1 = 9$

a 95% CI for $\mu$ is

$$531 \pm (2.262)\left(\frac{82.79}{\sqrt{10}}\right)$$

$$\Rightarrow 531 \pm (2.262)(26.1810)$$

$$\Rightarrow 531 \pm 59.2214$$

$$\Rightarrow (471.78, 590.22)$$

ie between \$471.78 and \$590.22

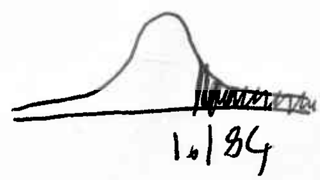
## Problem 7.4

$H_0: \mu \leq 500$ (ie mean rent is 500 or below)

$H_A: \mu > 500$ (ie mean rent above 500)

test statistic $t = \dfrac{531-500}{82.79/\sqrt{10}} = 1.184$

$Pvalue = P(T > 1.184)$




$df = 10-1 = 9$

$1.100 < 1.184 < 1.383$

$.15 > P(T > 1.184) > .10$

So since $.1 < Pvalue < .15$ cannot reject $H_0$.
we cannot conclude that the mean rent is above \$500.

## Problem 7.33

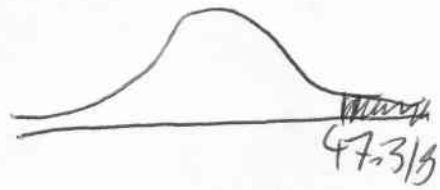
Let $\mu$ = mean increase in amount charged if given special offer.

$H_0: \mu \leq 0$ (no increase in amount charged)

$H_A: \mu > 0$ (increase in amount charged)

test statistic $t = \dfrac{565 - 0}{267/\sqrt{500}} = 47.318$ (3dp)

Pvalue $= P(T > 47.318)$




$df = 500 - 1 = 499$

use $df = 100$ line in table

$3.390 < 47.318$

$\Rightarrow .0005 > P(T > 47.318)$

Since Pvalue is so small reject $H_0$. i.e.
conclude that amount charged increased
by getting offer.

(b) A 95% CI for $\mu$ is

$565 \pm 1.984 \dfrac{267}{\sqrt{500}}$

$\Rightarrow 565 \pm 1.984(11.941)$

$\Rightarrow 565 \pm 23.690$

$\Rightarrow (541.31, 588.69)$

(c) the t-distribution does depend on the assumption of normality, but since we are dealing with inferences about the sample mean $\bar{x}$, the Central Limit Theorem helps us. When we take a large enough sample (and 500 is surely large) $\bar{x}$ will have (at least approximately) the normal distribution.

(d) They should carry out a randomized comparative experiment. Randomly assign 250 customers to get offer and other 250 to not get offer. Then later compare mean increase in spending between the two groups.

Problem 7.36

Let $\mu$ = mean blood pressure for population

(a) A 95% CI for $\mu$ is $\qquad df = 27 - 1 = 26$

$$114.9 \pm 2.056 \frac{9.3}{\sqrt{27}}$$

$$\Rightarrow 114.9 \pm 3.68 \Rightarrow (111.22, 118.58)$$

(b) SRS, independence, normality ← most important
helped by CLT even if not normal