Math 146 **8.3 - Testing A Claim About A Mean**

NOTATION

$\overline{x}$ = sample mean — μ_O = population mean (used in H_o)

s = sample standard deviation — σ = population standard deviation

n = sample size

***t*-Test for a Population Mean: σ is NOT Known**

REQUIREMENTS

1. The sample is a Simple Random Sample
2. The population is normally distributed **OR** $n > 30$ (the *t*-test is *robust* against a departure from normality, meaning the test works reasonably well if the departure from normal isn't too extreme.)

The test statistic is given by

$$t = \frac{\overline{x} - \mu_o}{s/\sqrt{n}}$$

When calculating critical values t^* and *P-values* using the *t*-distribution, remember the degrees of freedom is $df = n - 1$.

EXAMPLE 1 Oxygen tanks for SCUBA diving are to have enough oxygen for 2.1 hours of use. A sample of 6 tanks resulted in a mean time of 1.93 hours of oxygen with a standard deviation of 0.18 hours. Is there evidence at the $\alpha = 0.02$ level that the true mean is less than 2.1 hours? (Assume normality.)

EXAMPLE 2 Data set 3 includes samples of 106 body temperatures with a mean of 98.2°F and a standard deviation of 0.62°F. Use $\alpha = 0.05$ to test the claim that the mean body temperature of the population is not equal to 98.6°F.

THE CONFIDENCE INTERVAL METHOD

Create a confidence interval using the sample data in Example 1 to test the hypotheses above. (What level confidence interval should be used?)

EXAMPLE 3 Chuck thinks the number of keys that most people carry is less than 5. Use the data we collected at the beginning the quarter to test that claim using $\alpha = 0.02$. Also, use the the confidence interval method to make the same conclusion. What confidence level is necessary?

Number of keys carried:

2	2	5	1	2	3	5	4	3	10	5	3	3	1	10	4
3	2	7	3	3	6	2	6	2	3	12	7	3	2	3	3

***z*-Test for a Population Mean: σ is Known** (Not very common or realistic)

In the extremely rare case where the population standard deviation σ is known, we can use the normal distribution with *z*-statistic

$$z = \frac{\overline{x} - \mu_o}{\sigma / \sqrt{n}}$$