8.5 TESTING A CLAIM ABOUT A MEAN: σ NOT KNOWN

NOTE: The criteria for choosing between a normal distribution and a Student t distribution are the same in this chapter as they were in Chapter 7.
(See Table 8-6, pg. 360)

How to decide which distribution to use:

* If σ is known and either the population is normally distributed or $n > 30$, use the normal distribution. ($z-$ scores)

* If the sample size is small and the population is grossly non normal, we would need to use the methods of Chapter 14.

* If all three of these conditions exist, use **Student *t* Distribution**:

1) The sample is a simple random sample.
2) The value of the population standard deviation σ is not known.
3) Either or both of these conditions is satisfied: The population is essentially normal or $n > 30$.

***#5, pg. 439

***#6, pg. 439

***#7, pg. 439

***#8, pg. 439

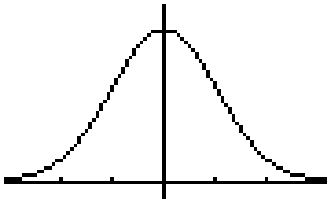
Critical Values for problems involving the Student t distribution are found in table A-3, pg. 754, according to **degrees of freedom** $(n-1)$, and **significance level** α

P – value - We'll use the calculator to find the p-value!

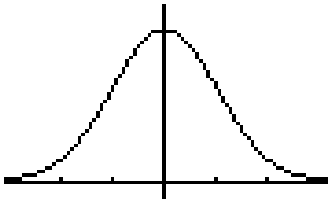
TEST STATISTIC: $t = \frac{\overline{x} - \mu_{\overline{x}}}{\frac{s}{\sqrt{n}}}$ Notice that the sample standard deviation s is used here.

Find Critical $t-$ values for a given hypothesis, sample size and α level:

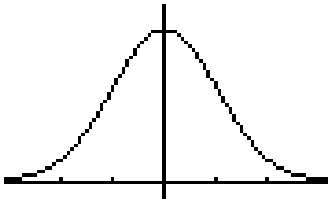
a) $H_0: \mu = 1.07$
$H_1: \mu > 1.07$
$n = 5$
$\alpha = .01$



b) H_0:
$H_1: \mu < 75.2$
$n = 14$
$\alpha = .05$



c) H_0:
$H_1: \mu \neq 64$
$n = 10$
$\alpha = .10$

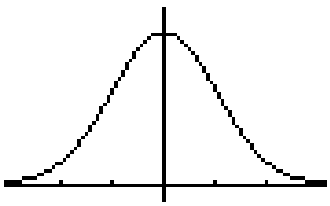


1. TRADITIONAL METHOD

You need to find the test statistic and the critical value

***#14, pg. 440

Claim:
H_0:
H_1:



Conclusion:

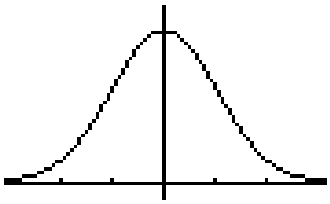
II. P — VALUE METHOD (We'll use the calculator to find the p-value!)

Select T-Test

***Do #14 using the P-value

***#18, pg. 440 – Use the traditional method, and write the conclusion.

Claim:
H_0:
H_1:



Conclusion:

Now find the P-value with the calculator

***#26, pg. 441 (Using Raw data)

We will use the calculator for this problem. Enter the data in a list. Then use STAT>>TESTS 2: T-Test Data (instead of summary statistics)

SUMMARY OF CHAPTER 8

TESTING CLAIMS ABOUT POPULATION PARAMETERS

I. TRADITIONAL METHOD:

Step 1: Identify **claim**, $\boldsymbol{H_0}$, $\boldsymbol{H_1}$.
Identify the test as: left-tailed, two-tailed, or right-tailed

Step 2: Identify the **Critical Values (C.V.)** and the **Critical Region**. (based on α)

Step 3: Identify and Compute the **Test Statistic**.

Step 4: Reject or Fail to Reject the Null Hypothesis

Step 5: State the Appropriate Conclusion (Flow Chart pg. 403)

II. *p*-VALUE METHOD:

Step 1: Identify **claim**, $\boldsymbol{H_0}$, $\boldsymbol{H_1}$.
Identify the test as: left-tailed, two-tailed, or right-tailed

Step 2: Identify and Compute the **Test Statistic**.

Step 3: Calculate the ***p*-value** associated with the test statistic
The *p*-value is the probability associated with the test statistic.
When using a normal distribution, we do it by hand.
When using the Student t distribution, we use the calculator to find it.

Step 4: Reject or Fail to Reject H_0.
Reject H_0 if p $< \alpha$
Fail to Reject H_0 if p $> \alpha$

Step 8: State the Appropriate Conclusion (Flow Chart pg. 403)

III-CALCULATOR

When testing a claim about a proportion, use 1PropZTest

When testing a claim about a mean and using a normal distribution, use ZTest

When testing a claim about a mean and using the Student t distribution, use TTest

8.3 TESTING A CLAIM ABOUT A PROPORTION

Assumptions:
1. Conditions for a binomial experiment are satisfied.
2. np ≥ 5 and nq ≥ 5, so that the binomial distribution of sample proportions can be approximated by a normal distribution with $\boldsymbol{\mu = np}$ and $\boldsymbol{\sigma = \sqrt{npq}}$.

Notation: n = number of trials
$\hat{p} = \frac{x}{n}$ (sample proportion)
p = population proportion (used in the null hypothesis)
q = 1 − p

Critical value: Use table A-2 or A-3 according to sample size.

Test Statistic for p: $z = \frac{\hat{p} - p}{\sqrt{\frac{pq}{n}}}$

With the calculator use: STAT>>TESTS 5:1-propZTest (p_0 is p, the proportion of H_0)

8.4 TESTING A CLAIM ABOUT A MEAN: σ KNOWN

Assumptions:
1. Sample is a simple random sample.
2. The value of the populaton standard deviation σ is known.
3. Either or both of these conditions is satisfied: The population is normally distributed or $n > 30$.

Critical Value: Use Table A-2 (based on α level)

Test Statistic for μ when $n > 30$ $z = \frac{\overline{x} - \mu_{\overline{x}}}{\frac{\sigma}{\sqrt{n}}}$
where $\mu_{\overline{x}}$ is the mean of the claim.

$p-$ value - Use table A-2 to find the probability of the test statistic, and then find the probability of the tail(s)

With the calculator use: STAT>>TESTS 1:Z-Test

8.5 TESTING A CLAIM ABOUT A MEAN: σ NOT KNOWN

* If σ is known and either the population is normally distributed or $n > 30$, use the normal distribution. ($z-$ scores)
* If the sample size is small and the population is grossly non normal, we would need to use the methods of Chapter 12.
* If all three of these conditions exist, use **Student *t* Distribution**:

1) The sample is a simple random sample.
2) The value of the population standard deviation σ is not known.
3) Either or both of these conditions is satisfied: The population is essentially normal or $n > 30$.

Critical value Use Table A-3 (based on Degrees of Freedom $n - 1$ and α level)

Test Statistic for μ $t = \frac{\overline{x} - \mu_{\overline{x}}}{\frac{s}{\sqrt{n}}}$

$p-$ value - Use calculator for p-value!

With the calculator use: STAT>>TESTS 2:T-Test