Chapter 8 (Hypothesis testing – one population)

Wording: "test the claim that…."

1) **The hypothesis is broken into 2 parts**
H_0 - null hypothesis
H_1 - alternate hypothesis

If the claim has the word "is" then it goes in the H_0
If the claim has the words "greater than", "less than", "different from" then it goes in the H_1

It is important where you put the claim because you will be coming back to this as you are deciding on how to word your final conclusion.

WORDING	SYMBOL
IS	= (ALWAYS IN THE H_O)
DIFFERENT FROM	$\neq$
GREATER THAN	>
LESS THAN	<

One of three population parameters will be tested. The population parameters are mean (μ), standard deviation (σ), *and* proportion (P)

2) **Calculate the test statistic**
There are 4 test statistics - the population parameter being tested determines which test statistic you will use.

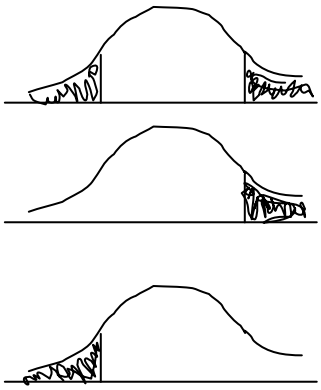
PARAMETER BEING TESTED	TEST STATISTIC USED	TI-84 select STAT, TESTS
μ (σ known)	$z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{n}}$	Z-test
μ (σ unknown)	$t = \dfrac{\bar{x} - \mu}{s / \sqrt{n}}$	T-test
σ	$\chi^2 = \dfrac{(n-1)s^2}{\sigma^2}$	----------
P	$z = \dfrac{\hat{p} - p}{\sqrt{pq / n}}$	1-propZtest

3) **Find your Critical Region**

Determine how many tails you are working with. Is it a two tailed, left tailed or right tailed? This depends on your set up in the H_1 (alternate hypothesis)

Example:

H_0: $\mu = 3$ H_1: $\mu \neq 3$	H_0: $\mu = 3$ H_1: $\mu > 3$	H_0: $\mu = 3$ H_1: $\mu < 3$
$\neq$ means you will be working with TWO TAILS	> means you will be working with A RIGHT TAIL	< means you will be working with A LEFT TAIL



Two tails – divide significance level α by 2

Right tail

Left tail

In all cases, the shaded region is known as the CRITICAL REGION. If your test statistic falls in the critical region then you will REJECT the H_0

Remember that the significance level α represents <u>the area</u> in the shaded region.

After you determine the critical region, find the critical values. Critical values separate the critical region from the non-critical region. Then you will see where your test statistic falls in comparison to the critical values.

Finding critical values: You need to decide which table you will be using. Is it A-2, A-3 or A-4? The table below should help in making that decision.

PARAMETER BEING TESTED	TEST STATISTIC USED	USING α OBTAIN CRITICAL VALUES FROM THE GIVEN TABLE
μ (σ known)	$z = \dfrac{\bar{x} - \mu}{\sigma / \sqrt{n}}$	A-2 Invnorm of left area also gives you your critical value
μ (σ unknown)	$t = \dfrac{\bar{x} - \mu}{s / \sqrt{n}}$	A-3
σ	$\chi^2 = \dfrac{(n-1)s^2}{\sigma^2}$	A-4
P	$z = \dfrac{\hat{p} - p}{\sqrt{pq / n}}$	A-2 Invnorm of left area also gives you your critical value

You will be using the significance level α and the appropriate table to find your critical values.

4) **Conclusion**
In your book you will find a chart that will help you with your conclusion.
It starts by asking if the original claim contains equality. Does your claim have the "=" symbol? If so it is in the H_0. If it does not have the "=" symbol then it's in the H_1. Continue with the chart to get the CORRECT conclusion.

Remember that you will either reject H_0 or fail to reject H_0
H_0 is rejected when the test statistic falls within the critical region.

USING THE P-VALUE METHOD:

1) Set up the hypothesis
   H_0 - null hypothesis
   H_1 - alternate hypothesis

2) Test statistic
3) Find the p-value
4) Conclusion

   H_0 is rejected when the p-value $\leq \alpha$. That means that the p-value has to be less than or equal to the significance level.

5) Wording of final conclusion: Write your conclusion in non technical terms - use the chart in your book

Use your calculator to find the p-value. Follow the chart below.

PARAMETER BEING TESTED	CALCULATOR COMMAND to find p-value
μ (σ known)	Stat, tests, z-test
μ (σ unknown)	Stat, tests, t-test
σ	*See note below
P	Stat, tests, 1propz-test

* There is no built in command that will give you the test statistic and p-value. However, you can obtain the p-value by going to 2nd, VARS, select $\chi^2 cdf$ ( ). Enter the test statistic, E99 which represents ∞ and degrees of freedom. It should look like this: $\chi^2 cdf(\chi^2, E99, df)$ to get E press 2nd, EE. If your result is greater than .5, subtract from 1 to get your p-value. Double your result for a two tail test.