**Learning Target** **• Significance Tests with Means**

This section is the same as 9.1 except we are testing means instead of proportions. A significance test compares statistics to a parameter to determine if you agree (support) or disagree (reject) with the parameter (also called Hypothesis Testing). The thinking goes like this:

**♦** **I can identify the mean parameter that I am interested in based on sample data ♦**

 (P) State the problem (in context) and the significance level (α) you are testing.

 **♦** **I can state a null and alternative hypothesis to test proportions♦**

 (H) Formulate your hypotheses: H0 and Ha in symbols and in words

 H0 is the null hypothesis and Ha is the alternative hypothesis.

 ALWAYS use the PARAMETER for both of these.

 (C) Check, Conditions, Calculations

Check your conditions for the test: $n\geq 30$

 If these conditions are met, draw the normal curve.

 Standard deviation = $\frac{σ}{\sqrt{n}}$

 Label the curve: µ in the center (target) and use the standard deviation you calculated to label. x̅ is used

 to determine where to shade (away from µ).

**♦** **I can determine if a test is one sided or two sided ♦**

 If the Ha is > or < the curve is one sided (shade above for > and below for <)

 If the Ha is ≠ shade both sides of the curve (the p-value will be doubled if it is two sided)

**♦** **I can compute the value of the test and the p-value when conditions have been met ♦**

 (T) Test statistic: $z=\frac{Statistic-Parameter}{St Dev}$ = $\frac{\overbar{x}- µ}{\frac{σ}{\sqrt{n}}}$

**♦** **I can compare the p-value to α to make a decision about the null hypothesis♦**

(A) Specify the level of significance (α) to be used. This level of significance tells you the probability of rejecting H0 when it is, in fact, true. (If not given, usually use 0.05 significance level). Make your decision compared to α. **Reject H0 or Do Not Reject H0**.

(C) Conclusion in context, usually just rewriting H0 (if do not reject H0) or Ha (if reject H0)

Example 1: A pharmaceutical company claims that each of its pills contains 20.00 milligrams of Coumadin (a blood thinner). You randomly sample 64 pills and find that x̅ = 19.82 mgs. and σ = 0.80 mgs. Is the company putting less than 20 mg in their pills? Test at α = 0.05.

P: Determine if the claim about the amount of Coumadin is correct based on a sample of 64 pills.

$μ$ = $\overbar{x}$ = n = α =

H: H0: μ = 20.00 mg Each pill contains 20 mg of Coumadin

 Ha: μ < 20.00 mg Each pill contains less than 20 mg of Coumadin

C: SRS: specified that sample is random.

 n > 30

 St. dev. = $\frac{σ}{\sqrt{n}}$ =

 Sketch curve and label $μ$, the standard deviation, location of $\overbar{x}$ and shade:

T: z test = $\frac{\overbar{x}-μ}{st dev}$ =

A: α = 0.05 $\rightarrow $ Since p-value is lower than α, reject the H0. This is statistically significant to believe the claim

 is unlikely.

C:

Remember, if you have an Ha of ≠ , shade both sides of the curve and double your p-value.