**Learning Target** **• Significance Tests with Proportions**

STATISTICS PARAMETERS

 MEAN

 ST. DEV.

 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:

* Make a hypothesis about the value of some parameter.
* The only facts available to estimate the true parameter are those provided by the sample (statistic).
* If the statistic differs from the hypothesis made about the parameter, a decision must be made as to whether or not this difference is significant.
* If there is a significant difference (to be considered unlikely), the hypothesis is rejected. If not, it cannot be rejected.

Two hypothesis are made:

**H0 : The null hypothesis**. This contains the hypothesized (or given claim) **parameter** value which will be compared with the sample value.

**Ha : The alternative hypothesis**. This contains the alternative **parameter** value (either <, >, or ≠ the parameter). This is true only if H0 is rejected.

To test the hypothesis, use z:

You test a hypothesis (claim about a parameter) by using sample evidence. The sample evidence is converted into a Z-score (standardized) using the hypothesized value (H0).

$$z=\frac{Statistic-Parameter}{St Dev}$$

Steps: PHCTAC (or P then spell CATCH from the bottom up, so P CATCH up)

**♦** **I can identify the proportion 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 significance test: $np\geq 10$ and $n(1-p)\geq 10$

 If these conditions are met, draw the normal curve.

 Standard Deviation = $\sqrt{\frac{p (1-p)}{n}}$ (Since you have p use it…. only use p̂ with confidence intervals)

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

 to determine where to shade (away from p).

**♦** **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: $z=\frac{Statistic-Parameter}{St Dev}$

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

(A) Specify the level of significance (α) to use for the test. 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: According to a national survey, 20% of all 18 to 24 year olds have passports. A random sample of 18-24 year olds found that 14 out of 50 had passports. Perform a significance test to determine if the proportion of 18-24 year olds with passports has increased. (Show ALL steps)

P: Determine if the proportion is higher than p at the 5% significance level (assume since not stated).

 p = p̂ = n = α =

 H0 : p = 0.20 The proportion of 18-24 year olds that have a passport is 0.20.

 Ha: p > 0.20 The proportion of 18-24 years olds that have a passport is more than 0.20 (increased).

C: $np\geq 10$ and $n(1-p)\geq 10$

 St. dev = $\sqrt{\frac{p (1-p)}{n}}$ =

 Sketch curve and label p, the standard deviation, location of p̂ and shade:

T: z test: $\frac{p̂-p}{st dev}$ =

A: α = 0.05 $\rightarrow $ Since p-value is not lower than α, cannot reject the H0. This is not statistically significant.

C: