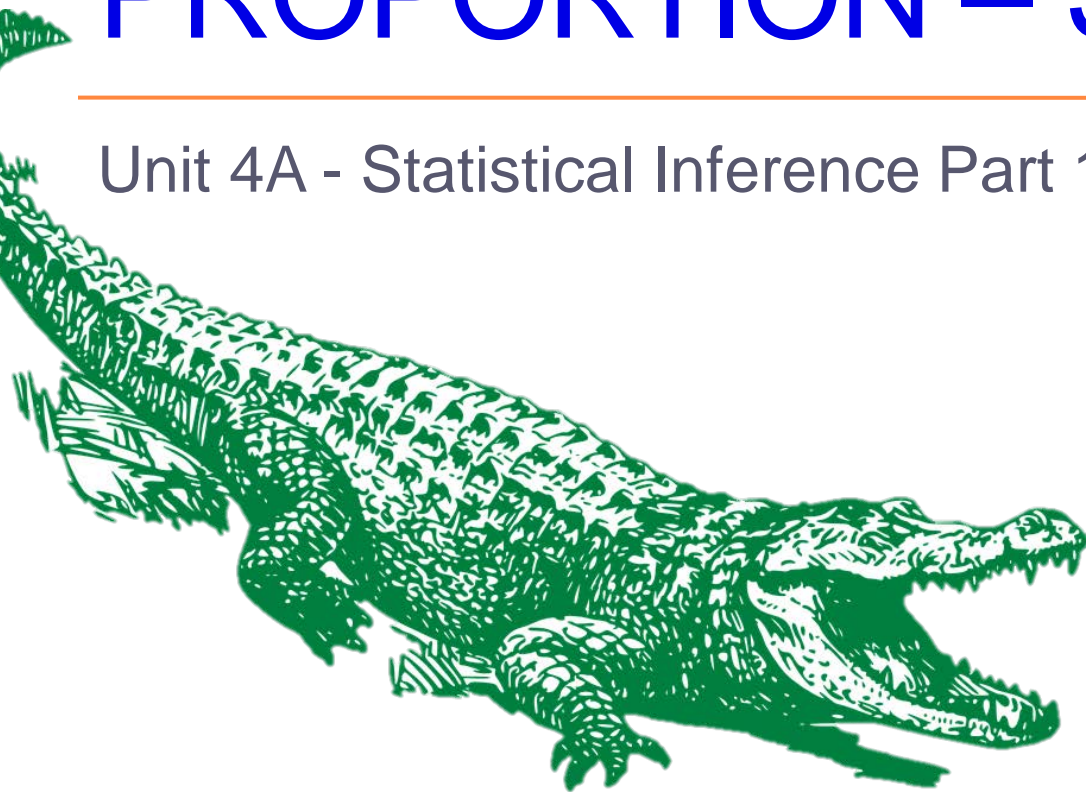
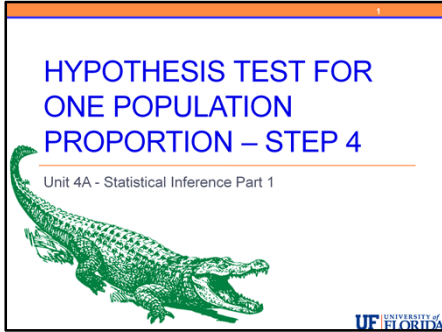


HYPOTHESIS TEST FOR ONE POPULATION PROPORTION – STEP 4

Unit 4A - Statistical Inference Part 1





Now let's look at STEP 4 for the **z-test for the population proportion (p)**.

This last part of the four-step process of hypothesis testing is the same across all statistical tests, and actually, we've already said basically everything there is to say about it, but we will go through it again here and discuss our examples.

Drawing Conclusions

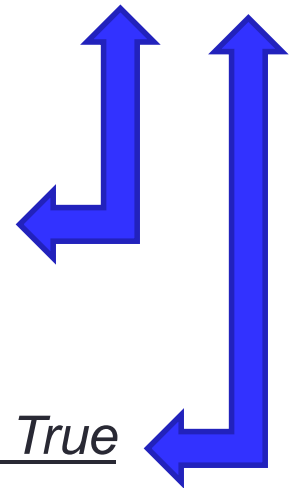
■ P-VALUE

- The **SMALLER** the p-value, the **further** \hat{p} is from p_0
- And the **MORE EVIDENCE AGAINST H_0**

■ Significance Level: $\alpha = 0.05$

- If p-value ≤ 0.05 then **WE REJECT H_0**
 - Conclusion: There **IS** enough evidence that *Ha is True*
- If p-value > 0.05 then **WE FAIL TO REJECT H_0**
 - Conclusion: There **IS NOT** enough evidence that *Ha is True*

IN CONTEXT!!



2

Drawing Conclusions

- **P-VALUE**
 - The **SMALLER** the p-value, the **further p-hat** is from p_0
 - And the **MORE EVIDENCE AGAINST** H_0
- **Significance Level:** $\alpha = 0.05$ **IN CONTEXT!!**
 - If p-value ≤ 0.05 then **WE REJECT** H_0
 - Conclusion: There **IS** enough evidence that *H_a is True*
 - If p-value > 0.05 then **WE FAIL TO REJECT** H_0
 - Conclusion: There **IS NOT** enough evidence that *H_a is True*

UF UNIVERSITY OF FLORIDA

The p-value is a measure of how much evidence the data present against H_0 .

The smaller the p-value, the more evidence the data present against H_0 .

We already mentioned that the significance level determines what constitutes enough evidence against H_0 . The significance level (α , alpha) is a cutoff point below which the p-value is considered small enough to reject H_0 in favor of H_a . The most commonly used significance level is 0.05.

- If p-value ≤ 0.05 then **WE REJECT** H_0
 - **Conclusion: There IS enough evidence that *H_a is True***
- If p-value > 0.05 then **WE FAIL TO REJECT** H_0
 - **Conclusion: There IS NOT enough evidence that *H_a is True***

Our preference is to always write the conclusion in terms of the alternative hypothesis – in the words of the problem. Where we have H_a is True in underlined italics, you need to substitute what the alternative hypothesis MEANS in this scenario, in other words in context or in the words of the problem.

It is important to mention again that this step has essentially two sub-steps:

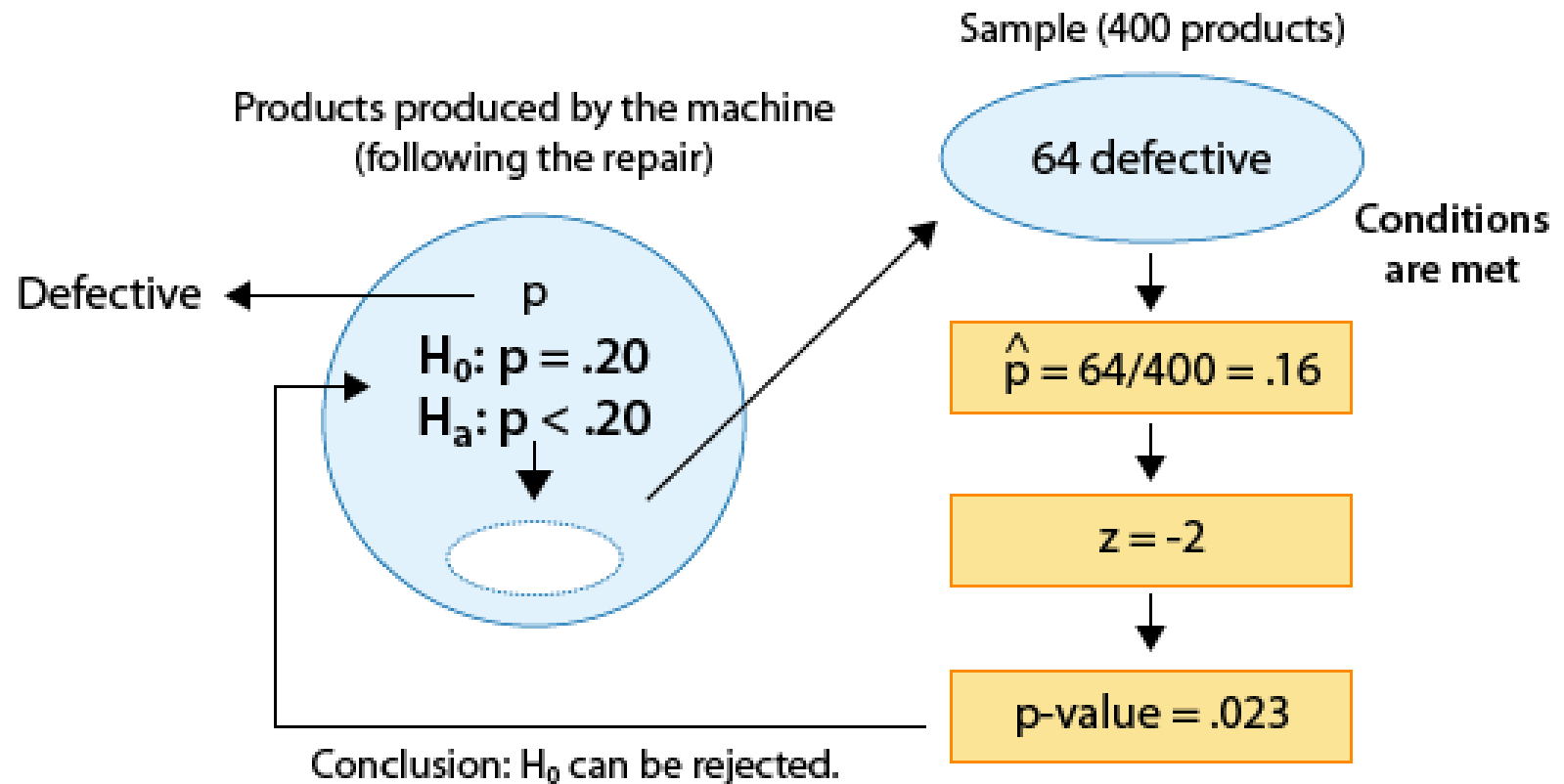
(i) Based on the p-value, determine whether or not the results are significant (i.e., the data present enough evidence to reject H_0).

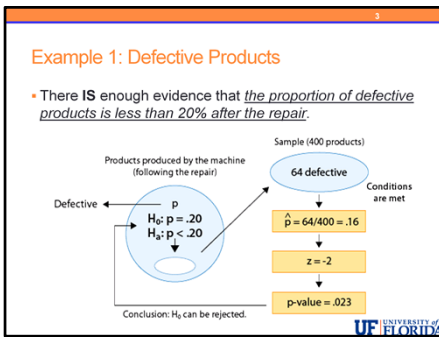
(ii) State your conclusions in the **context** of the problem.

Let's go back to our three examples and draw conclusions

Example 1: Defective Products

- There **IS** enough evidence that the proportion of defective products is less than 20% after the repair.





Has the proportion of defective products been reduced as a result of the repair?

We found that the p-value for this test was 0.023.

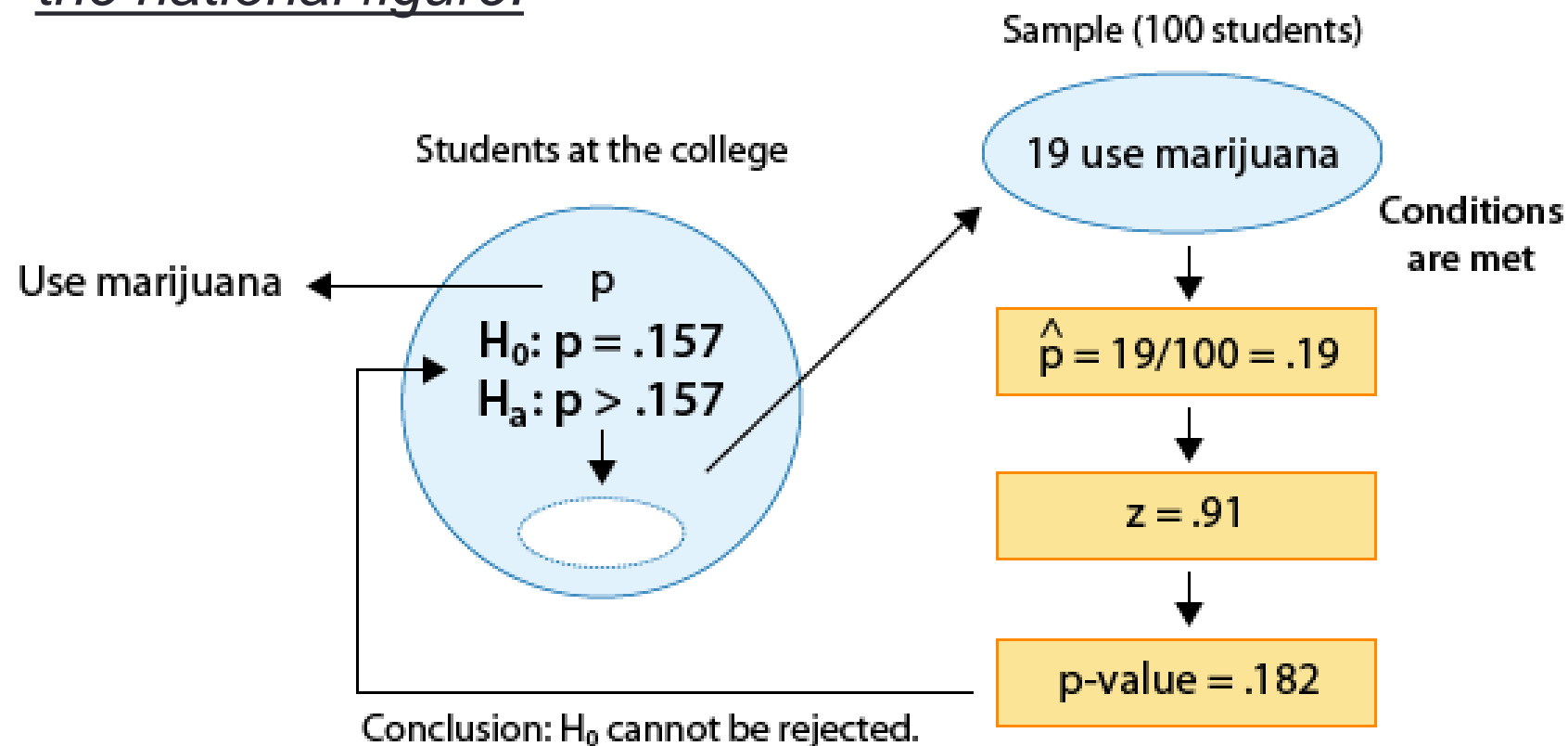
Since 0.023 is small (in particular, $0.023 < 0.05$), the data provide enough evidence to reject H_0 .

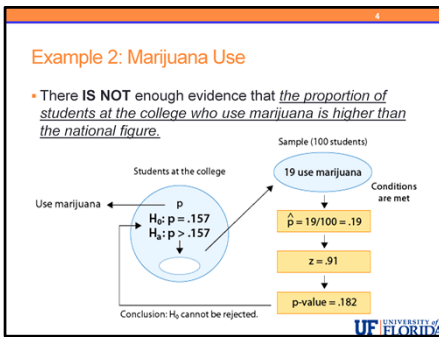
Conclusion:

There **IS** enough evidence that the proportion of defective products is less than 20% after the repair.

Example 2: Marijuana Use

- There **IS NOT** enough evidence that the proportion of students at the college who use marijuana is higher than the national figure.





Is the proportion of marijuana users in the college higher than the national figure?

We found that the p-value for this test was 0.182.

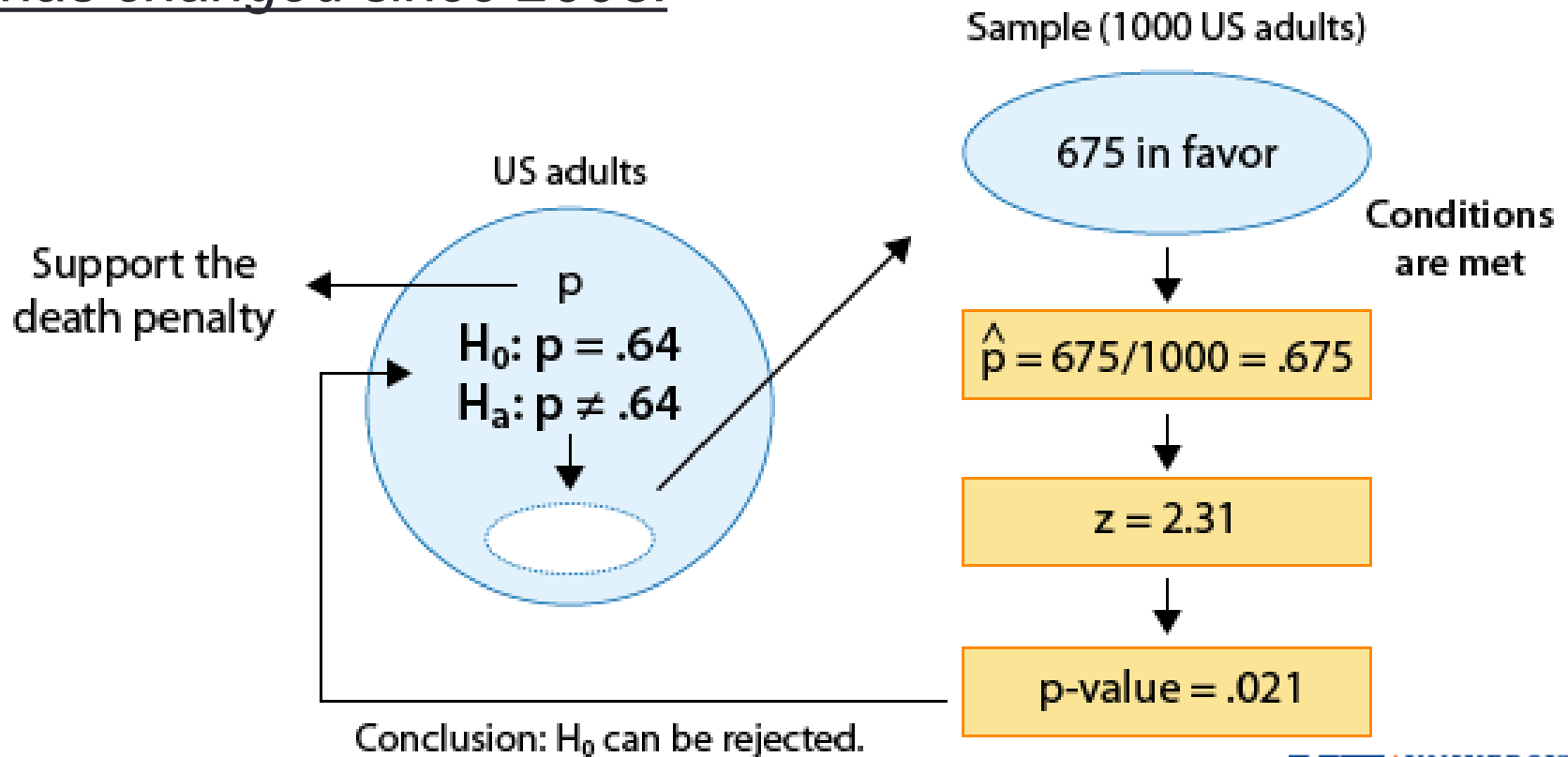
Since .182 is *not* small (in particular, $0.182 > 0.05$), the data do not provide enough evidence to reject H_0 .

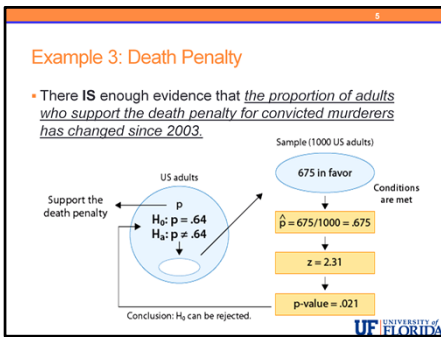
Conclusion:

There **IS NOT** enough evidence that the proportion of students at the college who use marijuana is higher than the national figure.

Example 3: Death Penalty

- There **IS** enough evidence that the proportion of adults who support the death penalty for convicted murderers has changed since 2003.





Did the proportion of U.S. adults who support the death penalty change between 2003 and a later poll?

We found that the p-value for this test was 0.021.

Since 0.021 is small (in particular, $0.021 < 0.05$), the data provide enough evidence to reject H_0

Conclusion:

There **IS** enough evidence that the proportion of adults who support the death penalty for convicted murderers has changed since 2003.

Summary

- **Step 1:** State the hypotheses
- **Step 2:** Obtain Data, Check Conditions, and Summarize Data
- **Step 3:** Find the P-VALUE of the Test
- **Step 4:** Conclusion IN CONTEXT

Summary

- **Step 1:** State the hypotheses
- **Step 2:** Obtain Data, Check Conditions, and Summarize Data
- **Step 3:** Find the P-VALUE of the Test
- **Step 4:** Conclusion IN CONTEXT

UF UNIVERSITY OF FLORIDA

We have now gone through this four-step process in the case of the z-test for one population proportion.

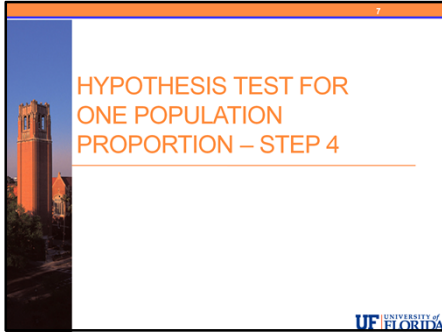
For all future tests, we will use software to calculate the test statistics and p-values for us but we will be responsible for doing everything else correctly.

From this point on, we will generally go through all of the steps quickly and then present examples, instead of going through the details of each step as we did here for our first and only by-hand method.

Review the summary at the bottom of this page in the materials to see a review of all of the needed steps for this z-test for one population proportion.



HYPOTHESIS TEST FOR ONE POPULATION PROPORTION – STEP 4



Before we move on to another test, our next material will discuss a few issues related to hypothesis tests.

For you this might also be a good time to review the earlier general discussion about hypothesis tests, in particular the discussion about Type I error, Type II error, and Power.

Also, please review the worksheet for hypothesis testing as it has many good examples and discussions on important concepts.