C9D3 - AP Stats 9.3 Power and Errors

Mr. B claims that he makes 80% of free throws. Ms. Congress is skeptical and believes that Mr. B makes (way) less than 80% of free throws. Mr. B has decided to take another SRS of 50 free throws to prove himself to the world!

1. Write the hypotheses for the significance test and define the parameter of interest.

p= 0.83 p= true proportion of free trows mude by **H**₀: 0 60.80 H_a: 2. Fill in the conditional probabilities and then describe the errors in the context of this setting: Type I = P(reject Ho | Ho true) data give convincing evidence for Ha Type II = P(<u>fail ryset Ho</u> | <u>Ha true</u>) - data do not give convincing evidence for Ha, even though Ha is correct

Now, use this applet to help label and shade the graphs.

- H_0 : $p_0 = 0.8$
- H_a : p = 0.66 (suppose this is Mr. B's true free throw success rate)
- Alternate Hypothesis: Select "Less"
- α = 0.05



3. Suppose we want to **increase** the power of our test. How could we adjust each of the following factors to increase power? Use the applet to explore each.



to reject H_0 is 0.79

Problem 2

The statistics teachers have decided to host a probability event (terrible pun!) at Gunn. In order to investigate the per-person expenses, a statistics student selects a random sample of guests invited to the event and records whether each person plans to attend. They decide to test H_0 : p = 0.75 versus H_a : $p \neq 0.75$ where p = the true proportion of all guests that will attend the event.

a. The power of the test to reject H_0 : p = 0.75 when p = 0.70 using $\alpha = 0.05$ and n = 25 subjects is 0.10. Interpret this value.

If the tore proportion of guests that will attend is 0.70, there is a 0.10 probability that they find convincing evidence to reject the null (Ho: p=0.75)

b. Find the probability of a Type I error and the probability of a Type II error for the test in part (a).

P(Type) ERMON) = & = 0.05 P (Type 11 ERKOK) = 1- POWER = 1-0.10=095

c. Determine whether each of the following changes would increase or decrease the power of the test. Explain your answers.

Use α = 0.01 instead of α = 0.05.

POWER WOULD DECKEASE. SINCE & IS SMALLER -> HARDER TO REJECT NUIL

Use n = 100 instead of n = 25.

Power would INCREASE SINCE SAMPLE SIZE INCREASED