Test of Hypothesis for Proportions

Null Hypothesis Ho: p = po

Alternative Hypotesis:	Rejection Region
• Ha: p ≠ po two sided	• |z|> z_(α/2)
• Ha: p > po one sided	• z> z_α
• Ha: p < po one sided	• z< z_α

Test Statistics:

$$z = \frac{(p-po)}{\text{sqrt}(po(1-po)/n)}$$

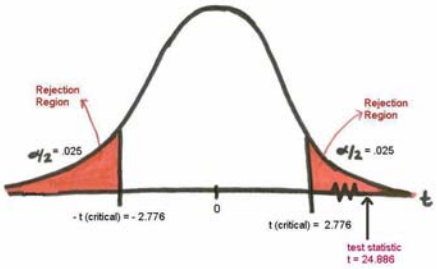
Ho 0r Ha ?

1. The proportion of adults that favor legalized gambling equals .5
2. The proportion of all college students who are regular smokers is less than .24

a) Ho b) Ha

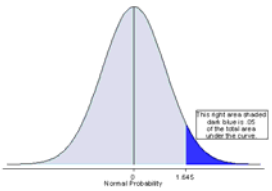
Ha: p ≠ po two sided

The corresponding rejection region looks like the two red tails



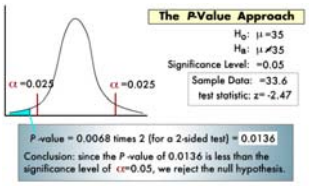
Ha: p > po one sided

The corresponding rejection region looks like the dark blue right tail



Ha: p < po one sided

The corresponding rejection region looks like the light blue left tail



Gender Bias?

For a large supermarket chain in Florida, a women's group claimed that female employees were passes over for management training in favor of their male colleagues. The company denied this claim saying they picked employees from the eligible pool of employees at random for this training. Statewide, the large pool of more than 1000 eligible employees who can be tapped for management training is 40% female, 60% male. Since this program began, 28 of the 40 employees chosen for management were male, 12 female.

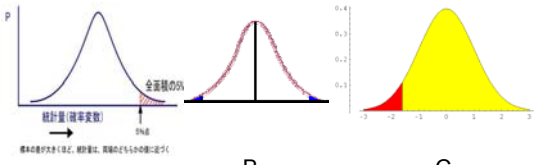
Test the hypothesis of gender bias

A. Ho: p=.5
B. Ho: p=.6

- A. Ha: p≠.6
- B. Ha: p>.6
- C. Ha: p<.6

The proportion of all college students who are regular smokers is less than .24
Ha: p<.24

The rejection regions is



A B C

P-value

"the probability that you get as bad a value as you got"

Alternative Hypotesis	Corresponding P-value
• Ha: p ≠ po two sided	P(|Z|>the value we got for z)
• Ha: p > po one sided	P(Z>the value we got for z)
• Ha: p < po one sided	P(Z<the value we got for z)

The proportion of all college students who are regular smokers is less than .24
Ha: p<.24

A study was run and the test statistic was computed to be z= -2.09

The p-value of the test is

A. P(|Z|>-2.09)
B. P(|Z|>2.09)
C. P(Z>-2.09)
D. P(Z<-2.09)

Which of these p-values are strong evidence against the null hypothesis?

A. p=.31
B. p=.001

Significance level α of the test

The level of the test is the probability of the rejection region. Stipulating the level is equivalent to specifying the rejection region.

The significance level of the test is the probability of a *type I error*:

"the probability of rejecting the null hypothesis when the null hypothesis is true"

We reject the null hypothesis at level α if the p-value < α

The proportion of all college students who are regular smokers is less than .24
Ha: p<.24

A study was run and the test statistic was computed to be z= -2.09

The p-value of the test is

A. P(|Z|>-2.09)
B. P(|Z|>2.09)
C. P(Z>-2.09)
D. P(Z<-2.09)

Do we reject at level:
a. α=.05 ?
b. α=.02 ?

The proportion of all college students who are regular smokers is less than .24
Ho: p=.24 Ha: p<.24

A study of 500 students obtained a sample proportion of .2. The test statistic is:

A. z=(.2-.24)/sqrt(.2(.8)/500) = -2.23
B. z=(.2-.24)/sqrt(.24(.76)/500) =-2.09
C. z=(.24-.2)/sqrt(.2(.8)/500) =2.23
D. z=(.24-.2)/sqrt(.24(.76)/500) =2.09

-2.23607

<u>Corresponding P-value</u>

- P(|Z|>the value we got for z)=2(1- Φ(z))
- P(Z>the value we got for z)=1-Φ(z)
-
- P(Z<the value we got for z)= Φ(z)

In this case the z value should be negative, otherwise something when wrong.

Steps in Tests of Hypothesis

1. Assumptions
2. Null and Alternative hypothesis
3. Test Statistic
4. Rejection Region or P-value
5. Conclusion in plain English and related to the situation of the problem