Q39

P327

$H_0: P = 0.4$

$H_a: P \neq 0.4$ (2 tailed test)

$\alpha = 0.05$

[note that problem asks us to run test at $\alpha = 0.01$ and then $\alpha = 0.05$. We shall do just the latter here in this demo]

test statistic

$$Z_{calc} = \frac{\hat{P} - P_0}{\sqrt{\frac{P_0(1-P_0)}{n}}}$$

from data, $\frac{x}{n}$

from H_0

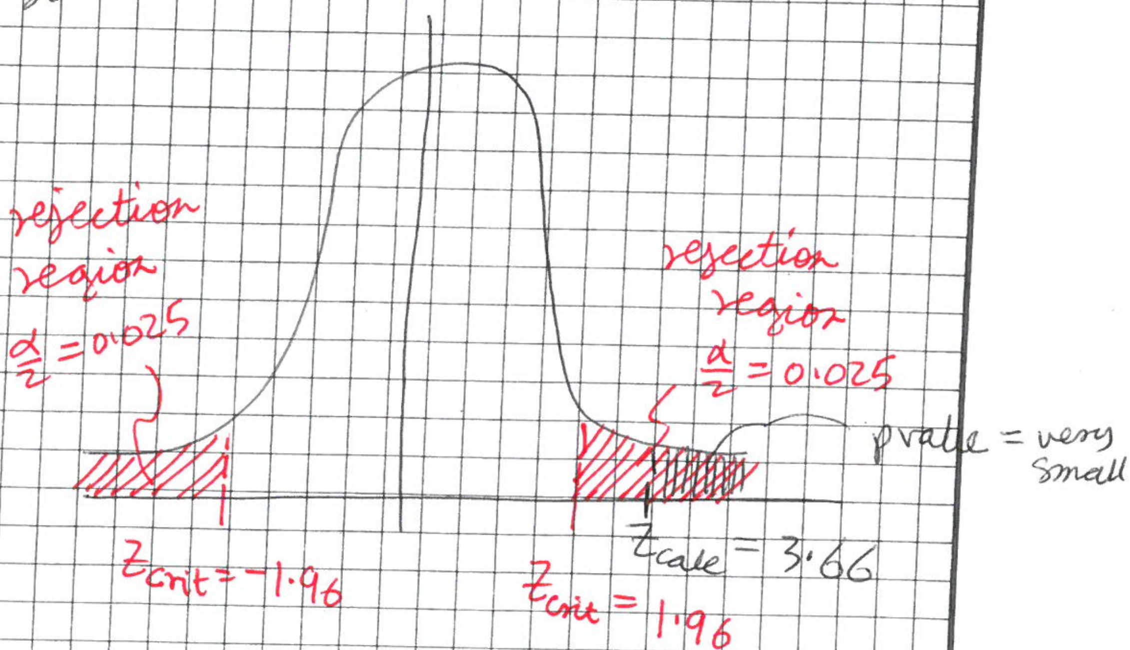
$$= \frac{\frac{82}{150} - 0.4}{\sqrt{\frac{0.4(1-0.4)}{150}}}$$

$$= 3.66$$

If you like p-values, go to the table and find the p-value for this z_{calc} value

$z = 3.66 \longrightarrow \alpha < 0.0002$

So



So we ~~the~~ must reject H_0!

So the percentage (or proportion) of type A donations, population-wise does differ from 40%. It in fact exceeds it because z_{calc} is way to the highest end

Now since this is a 2-tailed we could have also conducted the test using a confidence interval of the true population proportion

~~95~~

$$95\,CI = \hat{p} \pm z_{\frac{\alpha}{2}} \sqrt{\frac{P_0(1-P_0)}{n}}$$

$$= \frac{82}{150} \pm 1.96 \sqrt{\frac{0.4(1-0.4)}{150}}$$

$$= 0.5466 \pm 1.96(0.04)$$

$$= [0.4682, 0.625]$$

So our $P_0 = 0.4 \notin [0.4682, 0.625]$

so we reject H_0.

Again, we can see from the CI that the true population proportion exceeds the value posited.

Q 53
P. 381
Panta.

$H_0 : P_1 - P_2 = 0 \sim P_0$

$H_a : P_1 - P_2 \neq 0$ (2-tail test)

$\alpha = 0.05$

so we may use

- critical values
- p-values
- confidence interval

$\hat{P}_1 = \frac{x_1}{n_1} = 0.176$, $n_1 = 529$ control group (placebo)

$\hat{P}_2 = \frac{x_2}{n_2} = 0.158$, $n_2 = 563$ olestra group

Pooled sample proportion

$$\bar{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{0.176(529) + 0.158(563)}{529 + 563}$$

$$= 0.1667$$

Test statistic

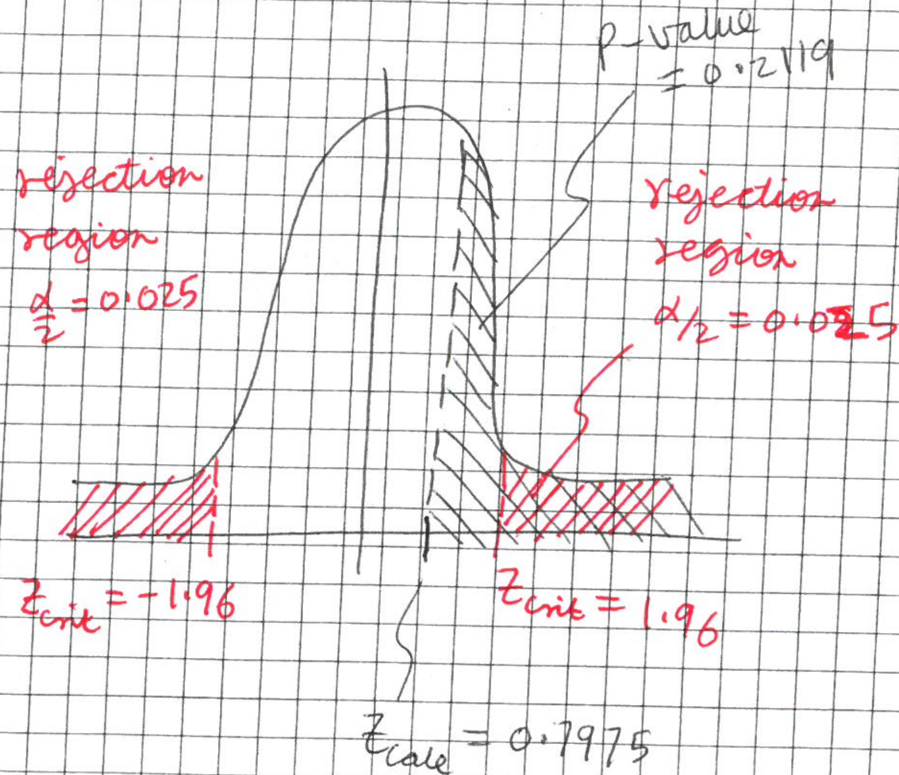
$$Z_{calc} = \frac{(\hat{p}_1 - \hat{p}_2) - p_0}{\sqrt{\frac{\bar{p}(1-\bar{p})}{n_1} + \frac{\bar{p}(1-\bar{p})}{n_2}}}$$

$$= \frac{(0.176 - 0.158) - 0}{\sqrt{\frac{0.1667(1-0.1667)}{529} + \frac{0.1667(1-0.1667)}{563}}}$$

$$= 0.7975$$

P- Value fans

$$Z = 0.7975 \longrightarrow \alpha = 1 - 0.7881 = 0.2119$$



So we are not in the rejection region. Fail to reject null hypothesis.

The rate of gastro intestinal problems is the same for consumers of 'regular' chips and the 'olestra' treated chips.

Confidence Interval Fans

$$CI = (\hat{P}_1 - \hat{P}_2) \pm Z_{\alpha/2} \sqrt{\frac{\hat{P}_1(1-\hat{P}_1)}{n_1} + \frac{\hat{P}_2(1-\hat{P}_2)}{n_2}}$$

$$95\% = (0.176 - 0.158) \pm 1.96 \sqrt{\frac{0.176(0.824)}{529} + \frac{(0.158)(0.842)}{563}}$$

$$= 0.018 \pm 1.96(0.0226)$$

$$= [-0.02628, 0.06228]$$

our $P_0 = 0 \in CI$

So, fail to reject H_0!

There is no differenc in rate of gastro intestinal disease from these chips versus 'regular' chips.