Ch 22 AP Stats
Prior Free Response
Difference of Two Proportion Z-Test

Name Key - 2 Ques

1. One hospital has 1000 live births during the summer, while a second hospital has 500 live births over the same time period.
   a) Assuming there is a 50% chance for a live-born male infant, which hospital is more likely to have less than 45% male births? Explain your answer. (Hint: think Ch 14 probability)
   b) Suppose the first hospital has 515 male births, while the second has only 240. Is the difference statistically significant? (Hint: Ch 22 two tailed test)

a) The second hospital is more likely to have less than 45% males because it is a smaller sample. The law of large numbers says that as the number of trials increases the observed probability will approach the true probability.

b) $\hat{p}_1 = .515$

$\hat{p}_2 = .480$

$p_c = \dfrac{515+240}{1000+500} = .503$

$\sigma = \sqrt{\dfrac{p_c(1-p_c)}{1000} + \dfrac{p_c(1-p_c)}{500}}$

$\sigma = \sqrt{\dfrac{(.503)(.497)}{1000} + \dfrac{(.503)(.497)}{500}}$

$\sigma = .0274$

$z = \dfrac{(\hat{p}_1 - \hat{p}_2) - (\text{hyp value})}{\sigma} = \dfrac{.515 - .480}{.0274} = 1.28$

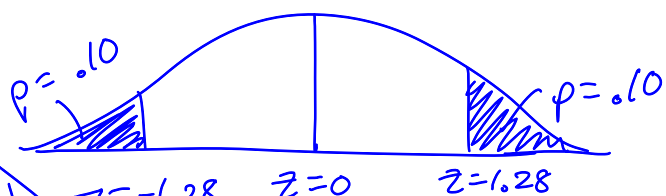
$P(z > 1.28) = 10\%$ $P(z < -1.28) = 10\%$
This is not unusual

$H_0: \pi_1 - \pi_2 = 0$

$H_a: \pi_1 - \pi_2 \neq 0$

$\alpha = .05$

conditions
- p are independent / random samples
- $n_1 p_1 \geq 10$ $n_2 p_2 \geq 10$ $n_1(1-p_1) \geq 10$ $n_2(1-p_2) \geq 10$



$P(z < -1.28) + P(z > +1.28) = .20$ is greater than α

I fail to reject. There is no difference in proportion of male births. This is NOT unusual.