

Quiz 13 Solution

True/False - No explanation needed. (1pt for correct, 0pt - no answer, -1pt - incorrect)

1. A Type I error involves concluding that two samples came from the same population when they actually came from different populations. True/False
False. It's Type II error.
2. If you compute a negative value of the independent-samples t statistic, you know youve made a mistake. True/False
False. t-statistic can be negative, say, if the observed mean less than the expected mean.

Problems - Need justification. No justification means **zero**!

1. (10pts) We roll two 4-sided dice 100 times and record the outcomes for the sum of the dice: 10 2's, 15 3's, 15 4's, 20 5's, 20 6's, 10 7's and 10 8's.
(a) Calculate the expected frequencies, given the null hypothesis H_0 that both dice are fair.

The expected frequencies for 2's, 3's, 4's, 5's, 6's, 7's, 8's are, respectively: $100 * 1/16 = 6.25$, $100 * 2/16 = 12.5$, $100 * 3/16 = 18.75$, $100 * 4/16 = 25$, $100 * 3/16 = 18.75$, $100 * 2/16 = 12.5$, $100 * 1/16 = 6.25$.

- (b) Take the significance level $\alpha = 0.1$, perform the χ^2 test and draw a conclusion.

H_0 : both dice are fair vs H_1 : not fair

$$\chi^2 = \frac{(10 - 6.25)^2}{6.25} + \frac{(15 - 12.5)^2}{12.5} + \frac{(15 - 18.75)^2}{18.75} + \frac{(20 - 25)^2}{25} + \frac{(20 - 18.75)^2}{18.75} + \frac{(10 - 12.5)^2}{12.5} + \frac{(10 - 6.25)^2}{6.25} \approx 7.33$$

$$\text{DOF} = 7 - 1 = 6$$

Critical χ^2 corresponding to $\alpha = 0.1$ and $\text{DOF} = 6$ is 10.64.
 $7.33 < 10.64$. Thus, fails to reject H_0