MATH 448 Bonus Homework, due Wednesday, May 1

Each of the following four problems can be completed for a 1% bonus applied to the Final Exam, for a total of at most a bonus of 4%.

- On a certain type of solitaire game, I have played 2569 games and won 1049 of them. The goal of the first two problems is to better understand my underlying probability p of winning each game.

  1. Construct a two-sided 90% confidence interval for p.

  2. Test the hypothesis $H_0 : p = 0.4242$ by calculating the p-value. Is this hypothesis plausible?

- My stats playing the game Wordle in a total of 550 games as are given by the following chart:

Score	1	2	3	4	5	6
Observed Frequency	0	32	173	222	102	21

  3. Let p_i denote the probability of getting the score i. Use the Pearson chi-square statistic to conduct a size $\alpha = 0.05$ hypothesis test for the hypothesis:

$H_0 : p_1 = 0.001,\ p_2 = 0.06,\ p_3 = 0.33,\ p_4 = 0.4,\ p_5 = 0.17,\ p_6 = 0.039.$

  4. You notice that the bar graph for the data resembles a bell curve, so you reconsider this categorical data as numerical data by equating the score of 1 with the interval $(0.5, 1.5]$, the score of 2 with the interval $(1.5, 2.5]$, and so on. Therefore, the bar chart can be considered as a histogram for continuous data. Use the Pearson chi-square statistic to calculate the p-value for the null hypothesis:

$H_0 :$ the scores are normally distributed with mean $\mu = 3.8$ and variance $\sigma^2 = 1$.

Is this hypothesis plausible?