MATH 448 Bonus Homework, due Wednesday, December 18

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 2803 games and won 1148 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 95% confidence interval for p.

  2. Test the hypothesis $H_0 : p \leq e^{-1} \approx 0.3679$ by calculating the p-value. Is this hypothesis plausible?

- My stats playing the game Wordle in a total of 772 games as are given by the following chart:

Score	1	2	3	4	5	6
Observed Frequency	0	39	253	321	127	32

  3. Let p_i denote the probability of getting the score i. Since any reasonable expected number of scores of 1 will be less than 5, we will assume $p_1 = 0$ and remove it from consideration and only consider the remaining five categories. Use the Pearson chi-square statistic to conduct a size $\alpha = 0.05$ hypothesis test for the hypothesis:

$$H_0 : p_2 = 0.06,\ p_3 = 0.33,\ p_4 = 0.4,\ p_5 = 0.17,\ p_6 = 0.04.$$

  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 $(-\infty, 1.5]$, the score of 2 with the interval $(1.5, 2.5]$, and so on, with the score of 6 giving the interval $(5.5, \infty)$. Use the Pearson chi-square statistic to calculate the p-value for the null hypothesis:

$H_0 :$ the scores are normally distributed with mean $\mu = 3.6$ and standard dev. $\sigma = 0.8$.

Is this hypothesis plausible?