Physics 336
HW5

For P1, P2, P3 and P5: Use Excel to do at least one problem, use Mathematica to do at least one problem, and use Python to do at least one problem. 10% bonus if you do each problem using two different platforms (mix and match as you see fit).

1. In an experiment to measure the acceleration due to gravity in Rexburg ($g = 9.8004$ m/s^2), a group of students drops a dense metal ball from a height of $h = 2.000 \pm 0.005$ m, and records the fall times using a stopwatch.

Trial	**fall time (s)**
1	0.64
2	0.57
3	0.55
4	0.69
5	0.53
6	0.66
7	0.67
8	0.74

   Does this data produce an accurate value for g?

2. In an experiment to measure the acceleration due to gravity in Rexburg ($g = 9.8004$ m/s^2), a group of students drops a dense metal ball from a height of $h = 2.000 \pm 0.002$ m, and records the fall times using an electronic timing apparatus. The data is in the accompanying file Setg.csv. Does this data produce an accurate value for g?

3. In Trials A and B, 6 coins are tossed, and the number of heads is recorded.

Heads	**Set A**	**Set B**
0	12	6
1	55	35
2	112	90
3	121	125
4	74	97
5	24	41
6	3	7

   (a) Assuming fair coins, calculate χ^2 for each trial. Is assuming fair coins a good assumption?

   (b) Without assuming anything about the fairness of the coins, use χ^2 to asses whether the two trials used the same coins tossed the same way.

4. Consider the accompanying data set, Set1.csv, the same data set you used in HW3 Problem 3. Suppose that this data is suspected to come from a parent Poisson distribution with $\mu = 4.5$. Supplement your Excel, Mathematica, and Python files from HW3 P3 to calculate χ^2 for this data. What conclusion do you reach?

5. In preparation for a half-life measurement, a background radiation measurement is taken. However, the sample container is inadvertantly left out, and so the measurement is retaken. The results are as shown

# of counts	**Without Container**	**With Container**
0	9	17
1	17	24
2	27	26
3	15	12
4	10	5
5	3	2
6	3	1

Does the presence of the container alter the background count?