1. (10pts) Do this part on your own. The experiment consists of tossing a quarter 3 times in a row. Repeat the experiment 40 times. (Thus, you will have tossed the coin altogether 120 times.)

a) Record in the first row below how many times you get each combination of heads and tails on your 40 experiments.

b) In the second row, enter the empirical probabilities for each combination based on your 40 experiments.

c) List all the (equally likely) outcomes of the experiment and use them to compute the theoretical probabilities for each combination. Enter them in the third row of the table. Round everything to 3 decimal points.

c) Compute the differences $P_E - P_T$.

Combination	3H	2H, 1T	1H, 2T	3T
Times occured	9	16	12	4
Empirical prob. P_E	$\frac{9}{40} = 0.225$	$\frac{16}{40} = 0.4$	$\frac{12}{40} = 0.3$	$\frac{4}{40} = 0.1$
Theoretical prob. P_T	$\frac{1}{8} = 0.125$	$\frac{3}{8} = 0.375$	$\frac{3}{8} = 0.375$	$\frac{1}{8} = 0.125$
Difference $P_E - P_T$	0.1	0.025	-0.75	-0.025

(more on reverse)

2. (10pts) Do this part with 2 or 3 classmates and turn in your sheets attached (you may belong to only one group). Write their names to the left of the rows labeled "Classmate". Each of you has to fill in the table independently, but the last three rows of this table should be the same for everyone in your group (check!).

a) Copy the "Times occured" line from above into row "You" and do the same for each of your classmates.

b) Sum by column and enter the sums in the row "Total".

c) Compute the empirical probability for each combination using the totals. The number of experiments is now larger because you are including your classmates' results.

d) Compute the differences $P_E - P_T$. Are they smaller than in the table above? Explain why they should be smaller.

In all cases they happen to be smaller than in first table. The more experiments we perform, the closer experimental probability is to theoretical probability.

Combination	3H	2H, 1T	1H, 2T	3T
You	9	16	12	4
Classmate	6	18	14	2
Classmate	5	12	16	7
Classmate				
Total	20	46	42	13
Empirical prob. P_E	$\frac{20}{120} = 0.167$	$\frac{46}{120} = 0.383$	$\frac{41}{120} = 0.35$	0.108
Difference $P_E - P_T$	0.042	0.008	-0.025	-0.017

Bonus. (2pt) Use the grade computer on the website to answer the following. Take into account only grades we had before this worksheet and assume you do not have attendance bonus points.

a) What is your current average in the course?

b) What average would you like to have after the third exam? What is the lowest score you need on the third exam to have this average?

c) What is the lowest score you need on exam 4 in order to have the desired average from b), assuming on exam 3 you got the score from the second part of b)?