Math 107
Test 3

Part I

Let's say you're the govenor of Indiana, and you must decide whether or not to hold the following lottery in your state.

Price per ticket: \$1 Chance of winning: 1 in 4

Outcome	*Probability*
$freeticket$	$1 in 4.35$
$win \$10$	$1 in 54$
$win \$100$	$1 in 593$
$win \$1,000$	$1 in 5,982$

1.) What's the expected outcome per player?

2.) What's the standard deviation per player?

3.) What's the standard deviation for the average of 18,704 people playing?

4.) What's the 95% conficence interval for 18,704 players?

5.) What's the expected outcome for the *population* of players?

6.) What's the standard deviation for the average winnings for the *population* of 18,704 players?

7.) What's the 95% confidence interval for the population of 18,704 players?

8.) If 18,704 people play in a day, what's the probability the populace of plyaers will come out ahead in one game?

9.) If 18,704 people play each day for a year (365 days), what's the probability the populace of players will come out ahead at least once in the course of the year?

Part II

Say we randomly choose 500 students at ND and ask them if making money was the most important factor to them in choosing a major. Say 180 say "yes".

Give a 95% confidence interval for the true % of ND students for whom making money was the most important factor to them in choosing a major.

Part III

Say a certain breed of fruit fly has a life expectency of 9 months (242 days) with a standard deviation of 11 days. We begin a breeding process which will hopefully produce fruit flys with shorter life spans. We then measure the average life span over the course of several generations, where each generation has 100 fruit flys in it.

1.) Make a control chart for the average life expectency per generation.

2.) Remark if the experiment appears to be working; and if so, how long it took until it started working.

Generation	*Average life span(days)*
1	241
2	242
3	239
4	244
5	241
6	254
7	244
8	242
9	242
10	239
11	238
12	236

(Note: you can do the control chart on the next page if you want.)

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Part IV

Whether a convicted murder gets the death penalty seems to be influenced by the race of the victim. Here are data on 362 cases in which the defendant was convicted of murder. [From M. Radelet, Racial characteristics and imposition of the death penalty, *American Sociological Review*, 46 (1981): 918 - 927.]

.	**White Defendant**		.	**Black Defendant**	
.	**Death**	**Penalty**	.	**Death**	**Penalty**
.	**Yes**	**No**	.	**Yes**	**No**
$WhiteVictim$	19	132	$WhiteVictim$	11	52
$BlackVictim$	0	9	$BlackVictim$	6	97
total	19	141	*total*	17	149

1.) What percentage of all white convicted murderers get the death penatly?

2.) What percentage of all black convicted murderers get the death penalty?

3.) Calculate the percentage of white convicted murderers get the death penalty based on the race of the victim, and the percentage of black convicted murderers get the death penalty based on the race of the victim (convert the "Yes" entries in the chart to percentages).

4.) Notice that Simpson's paradox holds: a higher percentage of white defendants are sentenced to death overall, but for both black and white victims a higher percent of black defendants are sentenced to death. Why is this the case?