Math 113: Classroom Activity 3   Name : _____
10 pts

Materials Needed:
        Pair of dice.

Craps is a game that is very difficult to figure out
theoretically (unless you've had some upper level
mathematics courses) and is best done by simulation.

What we're going to do is determine the average
length of a craps game by playing 36 games and
finding the average number of rolls. We'll also use
the results to find the chance of winning or losing a
craps game.

> **Game of Craps**
> 1. Roll a pair of dice. If a sum of 7 or 11
>   occurs, you win; if a sum of 2, 3, or 12
>   arises, then you lose; any other sum is
>   called a point.
> 2. If you roll a point on your first roll, then
>   you must continue to roll the dice. If
>   you roll your point again before rolling a
>   7 then you win; if you roll a 7 before
>   you roll your point again then you lose.

Here are some example rolls so you can see how the game is played.

Sample #	Initial Roll	Initial Result	Final Result	# of Rolls	Actual Rolls (you don't need to record these)
1	7	W	W	1	7
2	6	P	L	6	6, 8, 3, 11, 9, 7
3	5	P	W	12	5, 4, 10, 8, 4, 8, 8, 11, 9, 3, 10, 5
4	5	P	L	3	5, 4, 7
5	11	W	W	1	11
6	7	W	W	1	7
7	9	P	W	5	9, 5, 11, 8, 9
8	5	P	L	2	5, 7
9	7	W	W	1	7
10	4	P	L	3	4, 6, 7
11	3	L	L	1	3

and so on ...

Notice that the 7 is only a winner on the first roll. If you roll a 7 while you're trying to get a point, you
lose. Also, the 2, 3, 11, and 12 are only special for the first roll. If you roll a 2, 3, 11, or 12 while trying
to get your point, you ignore them. Only the point or a 7 matter when trying to get a point.

1.	Shoot craps 36 times. Record the outcomes of the games in the table below.

Game	Initial Roll	Initial Result	Final Result	# of Rolls	Game	Initial Roll	Initial Result	Final Result	# of Rolls
1					19				
2					20				
3					21				
4					22				
5					23				
6					24				
7					25				
8					26				
9					27				
10					28				
11					29				
12					30				
13					31				
14					32				
15					33				
16					34				
17					35				
18					36				

2.   Create a distribution for the initial roll of the dice.

Roll	2	3	4	5	6	7	8	9	10	11	12
Freq											
%											

3.   Create a distribution for the result of the initial roll of the dice.

Initial Result	Win	Lose	Point
Frequency			
Percent			

4.   Create a marginal distribution for the final result of game.

Final Result	Win	Lose
Frequency		
Percent		

5.   Summarize the **number of rolls** that it took to play a game.

Sum	Mean	Median	St. Dev	Variance

6.   Make a histogram for the number of rolls that it took to play a game. Describe the shape of the histogram choosing from words like uniform, unimodal, bimodal, symmetric, skewed to the left, or skewed to the right. You do not need to copy down the graph or print it out.

7.   Collect the total number of rolls for 36 games from each of the teams (including your own) and record below.

8.   Use the class data in question 7 to find the average number of rolls for a game of craps (remember that each value in the table above represents 36 games, not 1).

9.   Upper level mathematics can be used to determine the actual marginal distribution for the final result of a game of craps is that you will win 49.29% of the time and lose 50.71% of the time. Look at the results and compare them to your results in question 4. Write about how close your results are to the actual values.

10.   The theoretical average length of a game is $3.3\overline{75}$ rolls. Compare this result to the your results from question 5 and the classes' results from question 8. Who is closer?