Classroom Activity 5 Math 113 Name : _____
10 pts Intro to Applied Stats

Materials Needed:

Dice

Instructions:

Two random variables will be studied. These are *x*, the number that is obtained when a single die is rolled, and $\overline{y}$, the average value that is obtained when a single die is rolled 40 times.

1. Do you expect to get the same average each time you roll 40 dice? Why or why not?

2. Have each student in the group roll the die 40 times while the other student records the rolls.

3. Average the results of the 40 rolls. In this way, each student will obtain an observation on the random variable $\overline{y}$.

   Record your average here: _____

Record the 40 rolls here

4. Generate another 40 rolls of the dice and obtain the value of $\overline{y}$.

   Record your average here: _____

Record the 40 rolls here

5. Collect the $\bar{y}$ values from each person in the class and record in the table.

6. Enter the data into the computer. Find the mean, variance, and standard deviation and record the information in the bottom row of question 12.

7. Generate a histogram. Copy the histogram below. Does it have the general shape indicated by the Central Limit Theorem?

8. Use the computer to generate a normal probability plot (you don't need to copy it down). Does the data appear normal? How can you tell?

9. Review the theoretical distribution of the discrete uniform random variable *x*.

x	1	2	3	4	5	6	Total
$p(x)$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	1
$x \cdot p(x)$	$\frac{1}{6}$		$\frac{3}{6}$	$\frac{4}{6}$		$\frac{6}{6}$	
$x^2 p(x)$	$\frac{1}{6}$	$\frac{4}{6}$		$\frac{16}{6}$	$\frac{25}{6}$		

10. Complete the table above and use the given formulas from chapter 16 to find the mean, variance, and standard deviation for the random variable *x*. Record your answers in the first row of the table in question 12.

The mean is $\mu = \sum x \cdot p(x)$.

The variance is $\sigma^2 = \left(\sum x^2 p(x)\right) - \mu^2$.

The standard deviation is $\sigma = \sqrt{\sigma^2}$

11. Complete these formulas from the Central Limit Theorem. Then apply the formulas to find the theoretical values for $\overline{y}$ in question 12.

a. The theoretical mean of the sample means,

$$Mean(\overline{y}) = \mu_{\overline{y}} =$$

b. The theoretical variance of the sample means,

$$Var(\overline{y}) = \sigma^2_{\overline{y}} =$$

c. The theoretical standard deviation of the sample means,

$$SD(\overline{y}) = \sigma_{\overline{y}} =$$

12. Record the theoretical values for outcome of the roll of a single die (found in question 10), the theoretical values for the mean of forty rolls of the die (found in question 11), and the observed values for our classroom sample (found in question 6).

	Mean	Variance	Standard Deviation
Theoretical Values for *x*.	$\mu =$	$\sigma^2 =$	$\sigma =$
Theoretical Values for $\bar{y}$, n=40	$\mu_{\bar{y}} =$	$\sigma^2_{\bar{y}} =$	$\sigma_{\bar{y}} =$
Observed Values for $\bar{y}$, n=40	$\bar{y} =$	$s^2 =$	$s =$

13. Comment on the closeness of our observed values to what the Central Limit Theorem predicted the values should be.