Math 113: Classroom Activity 10 Name : _____
10 pts

Materials Needed:

12 dice per group.

Instructions:

Dice are often made by drilling holes out of the plastic and using paint to fill the holes. The paint is less dense than the material the of the die and the paint doesn't completely fill the hole, so the dice should be slightly off center and the 5 and 6 sides should be lighter (therefore appearing more). We can roll one die 120 times or 12 dice ten times. We've opted for rolling 12 dice ten times.

1. Roll the twelve dice and record the frequency of each side. Repeat the process nine more times so that there are 120 rolls total.

2. Since we're rolling 120 dice, how many times should we expect each side to appear if the dice are fair?

3. Total each row (should be 12) and each column as well as the grand total.

4. Are the assumptions of a χ^2 Goodness of Fit test met (write yes or no for each one)?

   a. The data represent a random sample.
   b. The sample data consists of frequency counts.
   c. The expected frequency of each category is at least 5.

Roll #	Frequency of Each Side						Tot.
	1	2	3	4	5	6	
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
Obs							

5. The claim is that the dice are not fair because of the way the dots are created. Write the null and alternative hypotheses.

   H_0:

   H_1:

6. At the $\alpha=0.10$ level of significance, what is the critical value?

7. Copy the observed frequencies from the table on the first page and complete the table to calculate the test statistic. Give at least three decimal places.

Side	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Obs							
Exp							
$(Obs - Exp)$							
$(Obs - Exp)^2$							
$\frac{(Obs - Exp)^2}{Exp}$							

8. What is the value of the test statistic?

9. Use Minitab to find the p-value.

10. The test statistic (does / does not) fall in the critical region.

11. The p-value is (less / greater) than the significance level.

12. The decision is to (reject / retain) the null hypothesis.

13. There (is / is not) enough evidence to (reject / support) the claim that the dice are not balanced.

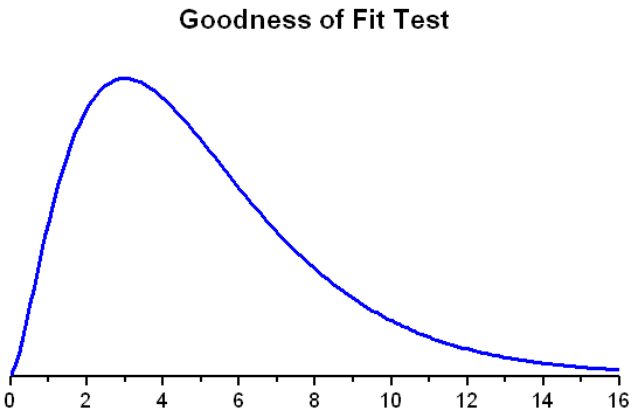
14. There (is / is not) enough evidence to (reject / support) the claim that the dice are fair.

15. Now, collect the total observed frequencies from all of the groups in the class and total them to get the combined results for the class.

Group	Number of Dots						Total
	1	2	3	4	5	6	
Total Observed							

16. At the $\alpha=0.10$ level of significance, what is the critical value?

17. Draw and label a vertical line at the critical value. Shade and label the critical region. Label the non-critical region. Label the area in the critical and non-critical regions using the proper symbolism involving α.



18. Copy the total observed frequencies from the table on the previous page and complete the table to calculate the test statistic. Give at least three decimal places.

Side	1	2	3	4	5	6	Total
Obs							
Exp							
$(Obs - Exp)$							
$(Obs - Exp)^2$							
$\frac{(Obs - Exp)^2}{Exp}$							

19. What is the value of the test statistic?

20. Use Minitab to find the p-value.

21. Go back to the graph in question 17 and draw and label a vertical line at the test statistic. Draw an arrow to the right of the test statistic and label it with the p-value.

22. The test statistic (does / does not) fall in the critical region.

23. The p-value is (less / greater) than the significance level.

24. The decision is to (reject / retain) the null hypothesis.

25. There (is / is not) enough evidence to (reject / support) the claim that the dice are not balanced.

26. There (is / is not) enough evidence to (reject / support) the claim that the dice are fair.