MATH 140 **Name** _____ **Date:**

Worksheet: Comparing two proportions

The Scene: In a study published in the *Journal of Personality and Social Psychology* (Butler and Baumeister, 1998), researchers investigated the conjecture that having an observer with a vested interest would *decrease* subjects' performance on a skill-based task.

Subjects were given time to practice playing a video game that required them to navigate an obstacle course as quickly as possible. They were then told to play the game one final time with an observer present. Subjects were randomly assigned to one of two groups. Group A was told that the participant and observer would each win $3 if the participant beat a certain threshold time, and Group B was told that only the participant would win the prize if the threshold were beaten. The table below summarizes the results

	Group A	Group B	Total
Beat threshold	3	8	11
Did not beat threshold	9	3	12
Total	12	11	23

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1. Calculate the sample proportion of successes for each group. Denote these by $\hat{p}_A$ and $\hat{p}_B$.

2. Do these sample proportions differ in the direction conjectured by the researchers?

We can use simulation to better measure the likelihood of getting such a big difference between the two sample proportions if there really was no difference between the two groups.

Assume that 11 of the 23 participants would have won the prize regardless of whether the observer was going to share the winnings. Then we can simulate the process of assigning subjects at random to the two groups, observing how often we obtain a sample result at least as extreme (3 or fewer successes assigned to A) as in the actual sample. Repeating this a large number of times will give us a sense for how unusual it would be for this sample result to occur by chance alone. Here's code for doing this 10 times in RStudio:

```
deck<-rep(c("s","f"),c(11,12))
trials=10
GroupAsuccesses=rep(0,trials)
for (i in 1:trials){
  groupA <- sample(deck,12)
  GroupAsuccesses[i]=sum(groupA=="s")}
print(GroupAsuccesses)
```

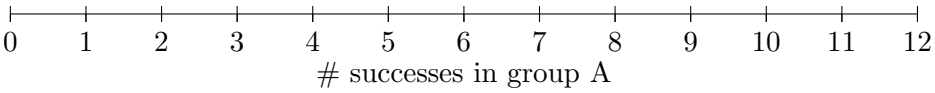
3. Record the results of your ten trials in the table below, and indicate whether the result is at least as extreme (in the direction of their research question) as the actual sample.

trial	1	2	3	4	5	6	7	8	9	10
Group A successes										
As extreme as actual study?										

4. Now record how often group A saw each number of successes in this results summary table:

# successes	0	1	2	3	4	5	6	7	8	9	10	11
count												

5. Combine your summary results with the rest of the class, forming a bar plot of the number of successes randomly assigned to group A:



6. What value or values are the most common? Explain why this makes sense.

7. What proportion of repetitions performed by the class as a whole gave a result at least as extreme as the actual sample (3 or fewer)?

8. Remember that for this sampling we assumed that the observer's incentive had no effect on the participant's performance. Based on these simulated results, does it appear that it is very unlikely for random assignment to produce a result as extreme as the actual sample when the observer has no effect?

9. In light of your answer to the previous question, considering that the actual sample is what the researchers found, would you say that the data provide reasonably strong evidence in support of the researchers' conjecture? Explain.