

Camila Vargas

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Question 2: Lab 1 Outputs

Write up the results of your Lab 1 work. I don't want all your output, please pick the interesting bits (and start thinking about what makes a result interesting?).

Rules: 1) If you roll the dice 20 times, and you get six 3 or 4 times and get 6 more than 5 then it is unfair and if you roll a six less than 5 times then it is fair. Based on the probability formula:

Probability of rolling a 6 in one roll: P , is $\frac{1}{6}$

$n=20$

Expected number of 6s= $E(X)=n \cdot p=20 \cdot \frac{1}{6}=3,33$

We would expect to roll about 3 or 4 sixes in 20 rolls, the results were that the altered dice had rolled 1 time for Karolina, 2 times for Alicia and 4 times for Camila, the interesting observation here was that even if the three dice rolled were altered we got three different outcomes and only one die rolled a six for times.

Probability distribution: The number of sixes in 20 rolls follows a binomial distribution with parameters.

$n=20$

$p=\frac{1}{6}$

$$P(x=4) = \binom{20}{4} \left(\frac{1}{6}\right)^4 \left(\frac{5}{6}\right)^{16} = 0,228$$

If an event falls outside the range of $\mu \pm 2\sigma$ (between 0 and 6 sixes), it is often considered unusual, getting 4 sixes lies within this range and it is not particularly unusual.

2. Ex: The results of Lab 1 where results passed the rules set established last class. The rules are since a chance of rolling a six is a 0.167 chance so anything higher or lower would be unfair. The sample will be ten dice rolls of altered and unaltered dice. The chance of rolling a six in the ten rolls sample is 1.67 chance so if the dice rolled a six

more than two times then it is unfair or at least favorable to the number six. The first die was unaltered and the second was a wet die rolled on sandpaper.

The results were that the unaltered die had rolled six only two times, but the altered die had rolled six three times. What makes the results interesting is that the altered die kept repeating the same numbers with the numbers one and three not showing in the rolls.

Based on the results of Sun Wo and Leo's results. It is clear that altering the shape of the die by having it shaved down or altering the texture by making it wet and rolling on a rough surface does alter the outcome of what number is rolled.

3) The playlist contains 20 songs, giving each song a 1 in 20 (or 5%) chance of being selected. However, two bands—Falling in Reverse and Mago de Oz—each have 4 songs in the playlist. This means songs by these bands have a combined 20% chance of being played. All the other songs come from different artists, with each of these artists contributing only one song.

Null Hypothesis: All 20 songs should have an equal chance of being selected, meaning a 5% chance for each song.

Alternative Hypothesis: The shuffle function shows favoritism toward songs from the same artists.

Null hypothesis: $p = 1/20$

Alternative hypothesis: $p \neq 1/20$

Synopsis: For the experiment, only 5 songs will be played. Since the shuffle automatically resets, no song will repeat until all the songs in the playlist have been played. Ideally, the 5 randomly selected songs should come from 5 different artists, with just one song from each of the two bands. To test whether Shuffle is truly randomized, we used three different modes, Spotify Free, Spotify Premium, and Apple Music, to reduce the risk of favoritism and also to test whether or not one app was more randomized than the other.

Playlist Link:

<https://open.spotify.com/playlist/4mOJdqckZXxJTFIXR8vkoE?si=YpOZHESoQ9-JTvEOG7Gngw&pi=D0YqPzKwT9K2o>

Shuffle#1 (Spotify – Free)	Shuffle#2 (Apple Music-Premium)	Shuffle#3 (Spotify - Premium)
"We Own the Night" by Dance Gavin Dance	"False Pretense" by The Red Jumpsuit Apparatus	"Carry On" - Falling In Reverse
"Unannounced" by Picturesque	"Congratulations" by Post Malone	"Talk to a Friend" - Rain City Drive
"No More Heroes" by The Stranglers	"Toxicity" by System of a Down	"We Own the Night" - Dance Gavin Dance
"Toxicity" by System of a Down	"No More Heroes" by the Stranglers	"San Diego" - blink-182
"Voyager" by Angels and Airwaves	"Unannounced" by Pictureques	"La cantata del diablo (Missit me...)" - Mägo de Oz

We fail to reject the null hypothesis, as each shuffle from the experiment played 5 different from 5 different artists, showing a lack of favoritism. Although throughout the 3 shuffles, some songs repeat, they never repeat in the same order and aren't followed by songs from the same artists. However, more testing is needed to fully assess the fairness of the shuffle. A future experiment

with 50 songs, where 40% of the songs come from just two bands, might provide better insight into whether the shuffles truly don't favor specific artists.