**Homework #2**  
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**Study Group Members:**

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**Results of Lab 1:**

**Experiment Protocols:**

* **PP1 Analysis:**
  + **Conclusion on Fairness:** We got a 6 on the first roll, dice judged to be not fair per PP1.
  + **Probability Analysis:**
    - If the Dice were Fair: 1/6 probability it would be judged to be unfair.
    - If the Dice were unfair: It would depend on the level of modification that the unfair dice underwent, furthermore a fair dice would be judged to be fair 5/6.
* **PP2 Analysis:**
  + **Conclusion on Fairness:**
    - Decision Rule: Dice is 6, 5 or more times and the dice is unfair.
    - My results: Rolled a 6, 9 times-Dice is Unfair.
    - Class Results: Rolled a 6, 3 times-Dice is Fair.
  + **Probability Analysis:**
    - If dice is rolled 20 times, likely number 6 results is 16.67% of the rolls or 3.33 times. Due to the law of large numbers:
      * Not unusual to get 1 more or less than that.
      * Not unusual to get 2 more or less than that.
      * Not unusual to get 3 more or less than that.
    - If the dice were fair, the chance it could be judged unfair is 16.67%.
* **PP3 Analysis:**
  + **Conclusion on Fairness:**
    - Decision Rule: Dice is a 6, 19 or more times and the dice is unfair.
    - Class Results: Rolled a 6, 17 times, so dice is Fair.
  + **Probability Analysis:**
    - It is fair to say that every conclusion has some confidence level attached.
    - Boundaries should be set where the results fall out of an expected range of outcomes.
    - If the dice were fair, the chance it could be judged unfair is 16.67%.
* **EP1 (Our Experiment Protocol):**
  + **Chosen Protocol:** For our Protocol we rolled the dice 50 more times to add to PP3 for a total of 150 rolls. The decision rule was if dice was a 6, 27 or more times it was judged to be unfair.
  + **Conclusion on Fairness:**
    - Class Results: Rolled a 6, 24 times therefore dice ruled to be fair.
  + **Conclusion:** I would revise the experiment to be a range of outcomes instead of a set number of times a 6 would be rolled. This will consider the dice being modified for another number or numbers to be rolled disproportionately other than the number 6. I feel this would be a better way to judge fair dice.

**Simulations with R:**

**Initial Setup:**

RCopy code

how\_many\_rolls <- 20 sim\_rolls <- sample(1:6, how\_many\_rolls, replace = TRUE)

**Analysis of the Simulation:**  
(Include any additional R code and results here)

**Insights Drawn from the Simulation:**

**Recommendations and Final Thoughts:**

(Here, you can express any further insights, comments or recommendations based on your experiments and simulations. Reflect on the overall fairness of the dice, the reliability of your protocols, and the implications of your findings.)