Sucurin Assignment by Abhishek Gasti

Part A

1. When rolling two six-sided dice (Die A and Die B), the total number of combinations possible is the product of the number of faces on Die A and Die B. Since both dice have 6 faces, the total number of combinations is:
   Total combinations: 6x6=36.
   This is because for every face on Die A, Die B can land on any of its 6 faces, resulting in a total of 6 x 6=36.

2. To calculate and display the distribution of all possible combinations when rolling two six-sided dice, we can generate a 6x6 matrix. The matrix will represent each possible outcome, with the rows representing the outcomes of Die A and the columns representing the outcomes of Die B.

   Each cell in the matrix will represent a specific combination (i.e., a pair of values from Die A and Die B), and the value in the cell will be the sum of the two dice.

   Mathematical Explanation:
   Since both Die A and Die B have 6 faces, there are a total of 6×6=36 combinations. Each combination is the sum of one face from Die A and one face from Die B. This forms a 6x6 matrix where each cell contains the sum of the respective die faces.

3. To calculate the probability of all possible sums occurring among the 36 total combinations of rolling two six-sided dice, we need to first determine how many ways each sum can occur and then compute the probability for each sum.

   Explanation:
   Total number of combinations: 6×6=36
   Sum ranges: The possible sums from rolling two six-sided dice range from 2 (when both dice show 1) to 12 (when both dice show 6).
   Example Calculation:
   - Sum = 2: There's only one combination where this occurs (Die A = 1, Die B = 1). Probability = 1/36
   - Sum = 7: There are six combinations where this occurs (Die A and Die B can be [1,6], [2,5], [3,4], [4,3], [5,2], [6,1]). Probability = 6/36.

Part B

The task here is to rebuild the dice in a way that keeps the probabilities of each possible sum the same as before. However, now Die A can't have more than 4 spots on any of its faces, while Die B can go beyond 6 spots if needed.

Key Rules:

- Die A: No face can have more than 4 spots.
- Die B: Faces can have more than 6 spots.
- Goal: The probability for each sum must stay exactly as it was with the original dice.

How We Approach This:

- Step 1: First, we calculate how often each sum (from 2 to 12) appears with the original dice setup.
- Step 2: Then, we change the values on Die A so that none of its faces have more than 4 spots. To make sure the sums stay the same, we adjust the corresponding values on Die B.

Example:

- With the original dice, a sum of 7 is the most common and happens 6 times out of 36 rolls.
- On the other hand, sums of 2 and 12 only happen once each.

To match these probabilities with the new rules, we tweak Die A to have values between 1 and 4 and balance it out by adjusting Die B accordingly.

This way, we satisfy the new conditions without messing up the odds of getting any particular sum.