Securin – Project Submission

## **Part A**

**1.How many total combinations are possible? Show the math along with the code!**

**Logic:**

Here, to find the total number of combinations. i.e. the number of pairs possible we just multiply the number of faces in Die A and number of faces in Die B.

Total number of combinations=length of Die A array \* length of Die B Array.

**2.Calculate and display the distribution of all possible combinations that can be obtained when rolling both Die A and Die B together. Show the math along with the code! Hint: A 6 x 6 Matrix.**

**Logic:**

To find all possible combinations while rolling 2 Die at a time. The logic finds all possible combinations and sums the faces of Die A and Die B to get the combination sum of all scenarios. i.e. 36 combinations. Which is stored in a 6\*6 matrix and displayed.

**3.Calculate the Probability of all Possible Sums occurring among the number of combinations from (2). Example: P(Sum = 2) = 1/X as there is only one combination possible to obtain Sum = 2. Die A = Die B = 1.**

**Logic:**

Logic proposed to find the probability of occurrence of all possible sums, includes a series of steps. Initially find all combination sums. And count the occurrence of each sum and divide it by total combinations possible.

To find all combination sum, the logic used for the above program i.e. (Q2) will be followed. Later all values between 2 and 12, their occurrence is counted and possibilities is found.

The reason to choose 2 -12 (both inclusive) is because the first possible combination is (1,1). Which sums up to 2. And the last possible combination is (6,6) which sums up to 12.

**Part B**

**You were happily spending a lazy afternoon playing.your board game with your dice when suddenly the mischievous Norse God Loki ( You love Thor too much & Loki didn’t like that much ) appeared. Loki dooms your dice for his fun removing all the “Spots” off the dice.No problem! You have the tools to re-attach the “Spots” back on the Dice.**

**However, Loki has doomed your dice with the following conditions:**

**● Die A cannot have more than 4 Spots on a face.**

**● Die A may have multiple faces with the same number of spots.**

**● Die B can have as many spots on a face as necessary i.e. even more than 6.**

**But to play your game, the probability of obtaining the Sums must remain the**

**same!**

**So if you could only roll P(Sum = 2) = 1/X, the new dice must have the spots reattached**

**such that those probabilities are not changed.**

**Input:**

**● Die\_A = [1, 2, 3, 4, 5, 6] & Die B = Die\_A = [1, 2, 3, 4, 5, 6]**

**Output:**

**● A Transform Function undoom\_dice that takes (Die\_A, Die\_B) as input &**

**outputs New\_Die\_A = [?, ?, ?, ?, ?, ?],New\_Die\_B = [?, ?,**

**?, ?, ?, ?] where,**

**● No New\_Die A[x] > 4**

**Logic:**

Initially we start the solution by calculation all possible probabilities of occurrences of sum. Using itertools and store the count in default dictionary.

Secondly each possible combination is interred and the probabilities are devised and checked with the original configuration.

If they match then the new configuration of the die is recorded and returned for both the dies.

Internally it involves various initialization which includes certain assumptions of initial values and conditional checks.

The solution uses 3 user-defined functions and various inbuilt tools to reach optimum level of space and time complexity.

[This solution is coded using python as python provides consistent output across platforms compared to java as java is compiler dependent]