1. A group of n 2 people decide to play an exciting game of Rock-Paper Scissors. As you may

recall, Rock smashes Scissors, Scissors cuts Paper, and Paper covers Rock (despite Bart

Simpson saying “Good old rock, nothing beats that!”). Usually, this game is played with 2

players, but it can be extended to more players as follows. If exactly 2 of the 3 choices

appear when everyone reveals their choice, say a, b 2 {Rock, P aper, Scissors} where a beats

b, the game is decisive: the players who chose a win, and the players who chose b lose.

Otherwise, the game is indecisive and the players play again. For example, with 5 players, if

one player picks Rock, two pick Scissors, and two pick Paper, the round is indecisive and they

play again. But if 3 pick Rock and 2 pick Scissors, then the Rock players win and the Scissors

players lose the game. 1 Assume that the n players independently and randomly choose

between Rock, Scissors, and Paper, with equal probabilities. Let X, Y, Z be the number of

players who pick Rock, Scissors, Paper, respectively in one game.

1. Find the joint PMF of X, Y, Z.

**Answer:**

PMF= for x+y+z=0 or else PMF=0

(b) Find the probability that the game is decisive. Simplify your answer (it should not involve

a sum of many terms).

**Answer:**

P(decisive, X=0)=

We have that the probabilities for case where Y=0 and Z=0 are the same, and we have required probability is P(decisive, X=0)=

(c) What is the probability that the game is decisive for n = 5? What is the limiting probability

that a game is decisive as n ! 1? Explain briefly why your answer makes sense.

**Answer:**

From (b), plugging n=5, so the probability that the game is decisive is 10/27.the probability when n🡪∞.

==0

Here I used 0<2/3<1 so we get limit answer as 0. Because it has intuitively because high no. of players gives probability that every possible outcome will be presented.