**Combinatorics HW 1.1**

**Student ID:** 2020280401 **Name:** Sahand Sabour **Score:**

1. **A large tournament has 569 entrants in total. If it is a single elimination tournament, how many matches have to be played out before the champion can be decided? (Please calculate the precise value)**

As mentioned in the problem statement, in each match of this tournament, there would be a single winner and therefore, a single elimination; That is, a single player is eliminated after each match. Hence, it can be derived that there exists a linear relationship between the number of matches to be played and the number of players to be eliminated: n matches have to be played in order to have n eliminations. Correspondingly, in order to have a single winner/champion from x players, x-1 players have to be eliminated, which requires x-1 matches to be played. Therefore, in this problem with 569 entrants, 569 - 1 = 568 matches have to be played out before the champion is decided.

1. **The figure below shows a partial 4X4 matrix，is there some way of filling up the rest of the omitted entries to produce a magic square of size 4？**

In a normal magic square, the numbers 1 to are used to fill in the square, where n is the size of the rows or columns of the square (n=4 in this case). Therefore, the sum of all the elements in the square can be calculated as

Based on the definition of the magic square, the sum of numbers in each row, each column, and each diagonal would be the same value. This value is referred to as the magic sum and can be calculated as

By observing the top row and left-most column of the given square, the following two equations can be derived