**Boolean Satisfiability Problem (SAT)**

**Problem definition:**

One hundred guests are invited to a party. Guests must be seated at ten tables, with each table having ten seats. However, certain conditions exist for seating guests at the tables. Suppose there is a list of guests who cannot sit at the same table. The list consists of pairs of guests who cannot sit together (e.g., if the list includes the pair (G1, G5), Guest G1 and Guest G5 cannot sit at the same table). Additionally, suppose there is a list of guests who must sit together no matter what. The objective is to seat all guests while also satisfying the given conditions.

The problem can be translated into a SAT problem by creating a boolean variable for each possible seating arrangement of a guest at a table. We will write these variables as where is the guest number (from 1-100) and is the table number (from 1 to 10). The variable is if guest is seated at table , and otherwise.

**Problem Solution:**

The constraints of the problem can be translated to SAT as follows:

1. **Each guest must sit at exactly one table.** For each guest , we need to ensure that they are seated at exactly one table.

For two different tables and :

1. **Certain guests cannot sit at the same table.** If there are two guests (e.g. G1, G5) that cannot sit at the same table , they should not sit at the same table.
2. **Certain guests must sit at the same table.** If there is a pair of guests (e.g. G3, G6) that must sit together, we need to make sure that for each table , if one sits at one table, the other must seat at that table too.