* Unification is a process of making two different logical atomic expressions identical by finding a substitution. Unification depends on the substitution process.
* It takes two literals as input and makes them identical using substitution.
* Let Ψ1 and Ψ2 be two atomic sentences and 𝜎 be a unifier such that, **Ψ1𝜎 = Ψ2𝜎**, then it can be expressed as **UNIFY(Ψ1, Ψ2)**.
* **Example: Find the MGU for Unify{King(x), King(John)}**

**Substitution θ = {John/x}** is a unifier for these atoms and applying this substitution, and both expressions will be identical.

* The UNIFY algorithm is used for unification, which takes two atomic sentences and returns a unifier for those sentences (If any exist).
* Unification is a key component of all first-order inference algorithms.
* It returns fail if the expressions do not match with each other.
* The substitution variables are called Most General Unifier or MGU.

**E.g.** Let's say there are two different expressions, **P(x, y), and P(a, f(z))**.

In this example, we need to make both above statements identical to each other. For this, we will perform the substitution.

            P(x, y)......... (i)  
            P(a, f(z))......... (ii)

* Substitute x with a, and y with f(z) in the first expression, and it will be represented as **a/x** and f(z)/y.
* With both the substitutions, the first expression will be identical to the second expression and the substitution set will be: **[a/x, f(z)/y]**.

Conditions for Unification:

**Following are some basic conditions for unification:**

* Predicate symbol must be same, atoms or expression with different predicate symbol can never be unified.
* Number of Arguments in both expressions must be identical.
* Unification will fail if there are two similar variables present in the same expression.

**Algorithm: Unify(Ψ1, Ψ2)**

Step. 1: If Ψ1 or Ψ2 is a variable or constant, then:

a) If Ψ1 or Ψ2 are identical, then return NIL.

b) Else if Ψ1is a variable,

a. then if Ψ1 occurs in Ψ2, then return FAILURE

b. Else return { (Ψ2/ Ψ1)}.

c) Else if Ψ2 is a variable,

a. If Ψ2 occurs in Ψ1 then return FAILURE,

b. Else return {( Ψ1/ Ψ2)}.

d) Else return FAILURE.

Step.2: If the initial Predicate symbol in Ψ1 and Ψ2 are not same, then return FAILURE.

Step. 3: IF Ψ1 and Ψ2 have a different number of arguments, then return FAILURE.

Step. 4: Set Substitution set(SUBST) to NIL.

Step. 5: For i=1 to the number of elements in Ψ1.

a) Call Unify function with the ith element of Ψ1 and ith element of Ψ2, and put the result into S.

b) If S = failure then returns Failure

c) If S ≠ NIL then do,

a. Apply S to the remainder of both L1 and L2.

b. SUBST= APPEND(S, SUBST).

Step.6: Return SUBST.