1 Possibly Useful Information

- **Canonical SQL Statement:**
  
  ```sql
  SELECT <attributes>
  FROM <tables>
  WHERE <conditions>
  GROUP BY <attributes>
  HAVING <conditions>
  ```

- **Functional Dependency (FD):** For a relation \( R \), and sets of attributes \( X \) and \( Y \), the functional dependency \( X \rightarrow Y \) holds if for any \( t_1, t_2 \in R \), \( t_1[X] = t_2[X] \implies t_1[Y] = t_2[Y] \).

- **Armstrong’s Axioms:** Let the \( A_i \)'s, \( B_j \)'s, and \( C_k \)'s be attributes:
  1. *Split/Combine:* If \( \{A_1, ..., A_n\} \rightarrow \{B_j\} \) for \( j = 1, ..., m \), then this is equivalent to \( \{A_1, ..., A_n\} \rightarrow \{B_1, ..., B_m\} \) and vice-versa.
  2. *Reduction/Trivial:* \( \{A_1, ..., A_n\} \rightarrow \{A_i\} \) for any \( i = 1, ..., n \)
  3. *Transitive Closure:* If \( \{A_1, ..., A_n\} \rightarrow \{B_1, ..., B_m\} \) and \( \{B_1, ..., B_m\} \rightarrow \{C_1, ..., C_p\} \) then \( \{A_1, ..., A_n\} \rightarrow \{C_1, ..., C_p\} \)

- **Closure:** Given a set of attributes \( X \) and a set of FDs \( F \), the closure \( X^+ \) is the set of all attributes \( y \) such that \( X \rightarrow y \).

- **Superkey:** Given a relation \( R \), a superkey is a set of attributes \( X \) such that \( X^+ \) is equal to the full set of attributes of \( R \).

- **Key:** A key is a minimal superkey, i.e. a superkey where no subset of it is also a superkey.

- **Boyce-Codd Normal Form (BCNF):** A relation \( R \) is in BCNF if for all sets of attributes \( X \), either \( X^+ = X \) (\( X \) is trivial) or \( X^+ = \) the set of all attributes (\( X \) is a superkey).

- **Conflicts:** Two actions conflict if they are part of different TXNs, involve the same variable, and at least one of them is a write.

- **Serializable:** A schedule is serializable if it is equivalent to some serial ordering.

- **Multi-Value Dependency (MVD):** Given a relation \( R \) with a set of attributes \( A \), and two sets of attributes \( X, Y \subseteq A \), we say that the MVD \( X \rightarrow Y \) holds if for any tuples \( t_1, t_2 \in R \) such that \( t_1[X] = t_2[X] \), there is a tuple \( t_3 \) such that:
  - \( t_3[X] = t_1[X] \)
  - \( t_3[Y] = t_1[Y] \)
  - \( t_3[A \setminus Y] = t_2[A \setminus Y] \)