

SQL 语法

With, Tmp Table

任何情况下，一个 table 都不能直接当做内容或判断条件使用，必须 select
引号只能用单引号，小数可用 Float 或 Real

Create Table

```
Create Table MyTest (
    a Integer Primary Key,
    b Varchar2(20),
    c Integer Not Null,
    d Integer Not Null,
    e Integer Initially Deferred Deferrable,
```

```
// 可选，推迟检查，插入时还没有就绪
f Integer,
Primary Key (a), // or like this
Unique (b,c),
Check (f>10),
```

```
Foreign Key (e) References E(eid)
// 可加 On Delete Cascade
);
```

Select

```
With Tmp1 As (
    Select ...
), // 后面还有 As 就要逗号
    Temp2 As (
        Select ...
        ) // 没有了不要逗号
    Select ...
```

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// 可选，推迟检查，插入时还没有就绪
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在 select 里面的，除了 group by 的那一列，不能直接使用那一列，必须使用 min sum 等，即使能够确保在里面相同也不行，可以在 group by 那里输入两列 (Group By b1, b2) 解决

```
Select ...
Group By b1
Having SUM(b3)>10; // 可选
// order by 要放在最后
```

Drop

```
Drop Table Users Cascade Constraints;
// 如果没有 Cascade Constraints,
// 如果别人依赖了这个表，就会报错
Drop View UserInfo; // No Cascade Constraints
Drop Sequence seq1; // No Cascade Constraints
// 需要注意大概率因为依赖了 table 就已经被删了，
// 不要再删，会报错
```

Drop

```
Create View UserInfo A5
Select ... // 接下来是 select 内容
Alter Table
```

Alter Table

```
Alter Table photos
Add ( // or Drop Column Email;
    // or Modify Date Integer;
Foreign Key (aid) References Albums(aid)
```

Create Trigger (注意最后有斜杠)

```
Create Trigger Order_Friend_Pairs
Before Insert On Friends
// or After, or Update Delete
For Each Row
Declare temp Integer; Begin
If :new.u1_id > :new.u2_id Then
    Temp := :new.u2_id; // 可为 OLD
    :new.u2_id := :new.u1_id;
    :new.u1_id := Temp;
End If; End;
```

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Selection σ : Selects a subset of rows from relation

Projection π : Deletes unwanted columns from relation

Cross-product \times : Allows us to combine two relations

Set-difference $-$: Tuples in reln. 1 and in reln. 2

Union \cup : Tuples in reln. 1 and in reln. 2

Condition (relation) σ $\sigma_{\text{sport} = \text{gymnastics} \wedge \text{country} = \text{USA}}(\text{Athlete})$

$\rho(\text{AFTER}, \text{BEFORE}) \rho(A1, \text{Athlete}) \times \rho(A2, \text{Athlete})$

$\rho(C(A1, \text{name} \rightarrow \text{name1}), A2, \text{name} \rightarrow \text{name2}),$

$\rho(A1, \text{Athlete}) \times \rho(A2, \text{Athlete}))$

Conditional join or Θ -join (Θ , $R \bowtie_C S$)

$R \bowtie_C S = \rho_{C(R \bowtie_C S, \text{id})}(S)$, where C is a condition

Equijoin Θ , $R \bowtie_{R.\text{id} = S.\text{id}} S$

- Join condition consists only of equalities on one or more columns (S . id column dropped as a duplicate)

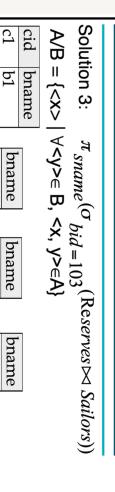
Natural Join $R \bowtie_S S$

- equijoin occurs on all the columns with the same name. Duplicated columns dropped.

Solution 1: $\pi_{\text{surname}}(\sigma_{\text{bid}=103}(\text{Reserves} \bowtie \text{Sailors}))$

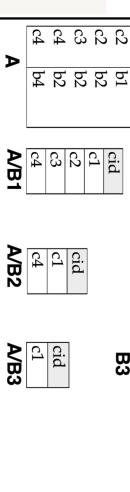
Solution 2: $\rho(\text{Temp1}, \sigma_{\text{bid}=103}(\text{Reserves})) \rho(\text{Temp2}, \text{Temp1} \bowtie \text{Sailors})$

$\pi_{\text{surname}}(\text{Temp2})$



Update

```
UPDATE B
SET b2 = 100, b3 = 200 // 可以只有1个,
WHERE b1 = 1; // 没有where就是整个表全部update
```



如果有依赖于它的，会无法删除，如果使用了 on update cascade，那个值也会更新

Delete

```
Delete
From ...
Insert Into Pairs Values (1,3); // 一次只能一个
```

如果有依赖于它的，会无法删除，如果使用了 on delete cascade，那个记录就会删除

On Delete Cascade, On Delete Set Null, On Update Set Default

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Basics

Physical / Conceptual / External Schema

Conceptual 只能是原始的表格，稍微改一点（哪怕是去掉一列）都不行

Logical / Physical independence

Logical: External / Conceptual schema interface
Physical: Conceptual / Physical schema interface

Primary key: 表中唯一的，用户定义的

Candidate key: 最小的唯一组合，去掉一个就不唯一，可作为潜在的 primary key (we can not say anything is definitely a candidate key, it is ID 都不行)

Partial key: weak entity 的确定元素

Schema: Students(sid:string, name:string, login:string, age:integer).类似于这样的没有 bool 类型，只能 1=1

ER Diagram

方框: Entity 菱形: 关系 圆圈: 属性 (Primary key 用下划线) **箭头:** 至多一个 粗线: 至少一个 **双线:** 适用于同种类型两个参与的, 比如 交朋友 或 发消息 或 A代表B (可在线旁边标记对属性)

Weak Entity (本身不能确定, 依赖另一个对象可确定): 加粗, 对应的方框和菱形都要加粗, key 用虚线下划线 **IS A:** 三角形, 箭头朝向更加广泛的类, 下面的边接向更具体的

Relationship with relationships (Aggregation): 虚线把一组图表框起来, 再连一根线到菱形, 注意, 这个关系本身也需要一张表

要一张表
done = false;
result = {R};
compute F+;

while (not done) do
if $\exists R_i \in result$ and R_i is not in BCNF

let $\alpha \rightarrow \beta$ be a nontrivial FD that holds in R_i such that
 $(\alpha \rightarrow \beta) \notin F+$ and $\alpha \cap \beta = \emptyset$;

result = (result - R_i) \cup ($R_i - \beta$) \cup (α, β) ;
else done=true ;

Java

```
Connection connection = null; // add try here
connection = DriverManager.getConnection("jdbc:sqlite:sample.db");
Statement statement = connection.createStatement();
statement.setQueryTimeout(30); // set timeout to 30 sec.
statement.executeUpdate("drop table if exists person");
statement.executeUpdate("create table person (id integer, name string, age double)");
statement.executeUpdate("insert into person values(1, 'leo', 22.3)");
statement.executeUpdate("insert into person values(10, 'jtc', 25.5)");
ResultSet rs = statement.executeQuery("select * from person");
while (rs.next()) {
    // 如果数据类型不匹配, 能转换就转换, 不能转换会返回 0
    System.out.print("name = " + rs.getString("name") + " , ");
    System.out.print("id = " + rs.getInt("id") + " , ");
    System.out.print("id = " + rs.getInt(1) + " , "); // 使用列数, 从1开始
    System.out.println("age = " + rs.getDouble("age"));
}
// catch, finally
connection.close(); // 也要 try
```

Others (不太重要的)

1 NF: 只有一个表格, 每条记录都包含所有属性
BCNF (Boyce-Codd Normal Form): for all $X \rightarrow A$ in F_+ , then $A \subseteq X$ (前提 F_+), or X is a super key (super key 等价于 unique)

3 NF: for all $X \rightarrow A$ in F_+ , then $A \subseteq X$ (前提 F_+), or X is a super key, or A is part of some (minimal) key BCNF 一定是 3 NF, 反过来不一定

Functional Dependencies: $X \rightarrow Y$, 知道了 X 就知道 Y
F+: Closure of F = Set of all valid FDs, 就是所有的, 自己推出自己、被包含都算, = Set of all FDs that can be derived from F using Armstrong's axioms

Armstrong's Axioms:

Reflexivity: If $Y \subseteq X$, then $X \rightarrow Y$ (trivial dependency)

Augmentation: If $X \rightarrow Y$, then $XZ \rightarrow YZ$ for any Z

Transitivity: If $X \rightarrow Y$ and $Y \rightarrow Z$, then $X \rightarrow Z$

Union: If $X \rightarrow Y$ and $X \rightarrow Z$, then $X \rightarrow YZ$

Decomposition: If $X \rightarrow YZ$, then $X \rightarrow Y$ and $X \rightarrow Z$

Lossless Join / Dependency Preservation

X 和 Y 可以 Lossless Join 当且仅当 $X \cap Y \rightarrow X$, or $X \cap Y \rightarrow Y$

R has a dependency-preserving decomposition to X, Y if

$F_+ = (F_X \cup F_Y) +$

Lossless-join, dependency-preserving decomposition of a relationship R into a collection of 3NF relations is always possible

Algorithm for BCNF (relation R, FDs F)

done = false;

result = {R};

compute F+;

while (not done) do

if $\exists R_i \in result$ and R_i is not in BCNF

let $\alpha \rightarrow \beta$ be a nontrivial FD that holds in R_i such that

$(\alpha \rightarrow \beta) \notin F_+$ and $\alpha \cap \beta = \emptyset$;

result = (result - R_i) \cup ($R_i - \beta$) \cup (α, β) ;

else done=true ;

1. **INNER JOIN** (内连接): 只返回两个表中匹配的行。如果表 A 中的行与表 B 中的某行按照连接条件相匹配, 那么这些行的组合就会出现在查询结果中。

2. **LEFT JOIN (左连接) 或 LEFT OUTER JOIN:** 返回左表 (LEFT JOIN 关键字左边的表) 的所有行, 以及右表中匹配的行。如果左表的行在右表中没有匹配的行, 则结果集中右表的部分将包含 NULL。

3. **RIGHT JOIN (右连接) 或 RIGHT OUTER JOIN:** 与 LEFT JOIN 相反, 它返回右表的所有行以及左表中匹配的行。如果右表的行在左表中没有匹配的行, 则结果集中左表的部分将包含 NULL。

4. **FULL JOIN (全连接) 或 FULL OUTER JOIN:** 返回左表和右表中所有的行。当某行在另一表中没有匹配时, 会在另一表的列位置显示为 NULL。这 essentially combines the results of both LEFT JOIN and RIGHT JOIN.

关于 outer, inner 的相对值, 所以 left right full 一定都是 outer, 没有其它情况

Reserves				
sid	sname	rating	age	bid
22	dustin	7	45.0	22
58	rusty	10	35.0	101

SELECT S.sid, R.bid FROM Sailors S NATURAL LEFT [OUTER]		
Result	sid	bid
Similarly:	58	null