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Lecture 32: More SQL

- Abstractly, a `select` statement that lists multiple tables filters *all possible combinations of rows* from those tables.

```sql
> create table T1 as
  select "a" as val union select "b";
> create table T2 as
  select 1 as val union select 2;
> select T1.val, T2.val from T1, T2;
```

```
a|1  
a|2  
b|1  
b|2  
```
Comparison to Python

• This includes the case where the same table is named twice, as in

```sql
select A.val, B.val from T1 as A, T1 as B;
```

| a | a |
| a | b |
| b | a |
| b | b |

• Thus, the `select ... from ...` part is rather like the `for` part of a list comprehension in Python:

```python
[ (A.val, B.val) for A from T1 for B from T1 ]
```

• The `where` clause is now a filter, like the `if` clause in a list comprehension.

```sql
> select A.val, B.val from T1 as A, T1 as B
  where A.val <= B.val;
```

| a | a |
| a | b |
| b | b |
Expressions

• **Familiar arithmetic is possible:**

  ```sql
  > select 3 + 4;
  7
  > select 3+GP from grade_values;
  7
  7
  6.7
  6
  6.3
  ...
  ```

• **Also string operations (not quite like Python):**

  ```sql
  > select First || " " || Last from students;
  Jason Knowles
  Valerie Chan
  ...
  ```
Aggregation

• Certain expressions aggregate results:

\[
\text{select avg(GP) from grades, grade_values where Letter=Grade and SID = 101;}
\]
3.25

\[
\text{select max(GP) from grades, grade_values where Letter=Grade and SID = 101;}
\]
3.7

\[
\text{select count(GP) from grades, grade_values where Letter=Grade and SID = 101;}
\]
4