



SQL: Data Manipulation Language

CSC 343 <https://powcoder.com>

Winter 2021 [Add WeChat powcoder](#)

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Why SQL?

SQL is a very high-level language.

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- Structured Query Language
- Say “what to do” rather than “how to do it.”
- Avoid a lot of data-manipulation details needed in procedural languages like C++ or Java.

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DBMSs determine the “best” method of executing a query.

- This is called “query optimization”.



Database Schemas in SQL

SQL is primarily a query language, used for retrieving data from a database.

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- Data Manipulation Language (DML)

<https://powcoder.com>

But SQL also includes a data-definition component for describing database schemas.

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- Data Definition Language (DDL)

Select-From-Where Statements

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SELECT → desired attribute(s)

FROM → one or more tables (i.e. entity sets)
<https://powcoder.com>

WHERE → condition about tuples of the tables

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Recall our Example

Our SQL queries will be based on the following database schema.

- Underlines indicates key attributes.

<https://powcoder.com>
Beers (name, manf)

Bars (name, addr, license)

Drinkers (name, addr, phone)

Likes (drinker, beer)

Sells (bar, beer, price)

Frequents (drinker, bar)



Example

Using BeersAssignment Project Exam Help

```
SELECT name  
FROM Beers  
WHERE manf = 'Anheuser-Busch';
```



Result of Query

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Bud

<https://powcoder.com>

Bud Light

Michelob

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...

The answer is a relation with a single attribute, name, and tuples with the name of each beer by Anheuser-Busch, such as Bud.



Meaning of Single-Relation Query

Begin with **Assignment Project Exam Help**

Apply the selection indicated by the WHERE clause.

Apply the extended projection indicated by the SELECT clause.

Operational Semantics - General

Think of a *tuple* visiting each type of the relation mentioned in FROM.

<https://powcoder.com>

Check if the tuple assigned to the tuple variable satisfies the WHERE clause.

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If so, compute the attributes or expressions of the SELECT clause using the components of this tuple.



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Operational Semantics

Tuple-variable t
loops over all tuples

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name

manf

<https://powcoder.com>

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Bud

Anheuser-Busch

If so, include
 $t.name$ in the
result

Check if
Anheuser-
Busch



Example

What beers are made by Anheuser-Busch?

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```
SELECT name  
FROM Beers  
WHERE manf = 'Anheuser-  
Busch';
```

<https://powcoder.com>

Add WeChat powcoder OR

```
SELECT t.name  
FROM Beers t  
WHERE t.manf = 'Anheuser-  
Busch';
```

NOTE: these two queries are identical.

Asterisks (*) in Select Clauses

When there is one relation in the FROM clause, * in the SELECT clause stands for “all attributes of this relation”.

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Example: Using Beers(name, manf)
<https://powcoder.com>

SELECT *
FROM Beers
WHERE manf = 'Anheuser-Busch';



Result of Query

	<code>name</code>	<code>manf</code>
	Bud	Anheuser-Busch
	BUD Light	Anheuser-Busch
	Michelob	Anheuser-Busch

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The result now has each of the attributes of Beers.



Renaming Attributes

If you want the result to have different attribute names, use "AS <new name>" to rename an attribute.

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Example: Using `Beers(name, manf)`

```
SELECT name AS beer, manf  
      FROM Beers  
     WHERE manf = 'Anheuser-Busch';
```



Result of Query

Assignment Project Exam Help	
Bud	Anheuser-Busch
Boo Light	Anheuser-Busch
Michelob	Anheuser-Busch
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...	...

The result now has each of the attributes of Beers.

Expressions in SELECT Clauses

Any valid expression can appear as an element of a SELECT clause.

EXAMPLE: Using <https://powcoder.com>

```
SELECT bar, beer, price*80 AS priceInJPY  
FROM Sells;
```

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Result of Query

bar	beer	priceInJPY
Joe's	Bud	285
Sue's	Miller	342
John's	Michelob	532
...

The result now has each of the attributes of Beers.



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Example: Constants as Expressions

Using Likes(*drinker, beer*) Project Exam Help

SELECT drinker, 'likes Bud' AS whoLikesBud
<https://powcoder.com>

FROM Likes

WHERE beer = 'Bud';
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Result of Query

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drinker	wholikesBud
George	likes Bud
Frank	likes Bud
Jenny	likes Bud
...	...

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Complex Conditions in WHERE clause

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Boolean operators: **AND, OR, NOT**.

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Comparison operators: **=, <>, < , >, <=, >=**.

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Example: Complex Condition

Using `Sells(bar, beer, price)`, find the price that Joe's Bar charges for Bud.

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<https://powcoder.com>

```
SELECT price  
FROM Sells  
WHERE bar = 'Joe``s Bar' AND beer = 'Bud';
```

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Patterns

A condition can compare a string to a pattern.

- <Attribute> **LIKE** <pattern> or <Attribute> **NOT LIKE** <pattern>

<https://powcoder.com>

Pattern is a quotes string.

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- % = “any string”;
- _ = “any character”.



Example: Like

Using [Drinkers](#) [Assignment](#) [Project](#) [Exam](#) [Help](#)

<https://powcoder.com>
SELECT name
FROM DRINKERS
WHERE phone LIKE '%555-_____';
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NULL Values

Tuples in SQL relations can have NULL as a value for one or more components.

The meaning is dependent on the context. In general, there are two common cases:

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1. *Missing Values*: e.g., we know Joe's Bar has some address, but we don't know what it is.
2. *Inapplicable*: e.g., the value of attribute **spouse** for an unmarried person.

Comparing NULL's to Values

The logic of a condition in SQL are 3 pronged:

1. TRUE

2. FALSE

<https://powcoder.com>

3. UNKNOWN

- Comparing any value (including NULL) with NULL yields UNKNOWN.

A tuple is in a query answer iff the **WHERE** clause is **TRUE**
(not **FALSE** or **UNKNOWN**).

RECALL



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EXAMPLE: Using ~~the~~ ~~the~~ ~~the~~ Project Exam Help

<https://powcoder.com>
SELECT bar, beer, price*80 AS priceInJPY
FROM AddWeChat powcoder



Result of Query

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bar	beer	priceInJPY
Joe's	Bud	285
Sue's	Miller	342
John's	Michelob	532
...

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String Functions in SELECT Clauses

EXAMPLE: Using ~~Assignment Project Exam Help~~ <https://powcoder.com>

```
SELECT bar, INSERT(beer, 1, 0, 'EH') AS 'Canadian beer', price  
FROM Seller
```

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Result of Query



bar	Canadian beer	price
Joe's	EH Bud	4
Sue's	EH Miller	5
John's	EH Michelob	7
...

The result reflects the renamed beers to reflect their inner Canadian.



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Three-Valued Logic

To understand how AND, OR, and NOT work in 3-valued logic

For TRUE results: <https://powcoder.com>

- **OR:** at least one operand must be **TRUE**.

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- **AND:** both operands must be **TRUE**.

- **NOT:** operand must be **FALSE**.



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Three-Valued Logic

To understand how AND, OR, and NOT work in 3-valued logic

For FALSE results: <https://powcoder.com>

- OR: both operands must be FALSE.
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- AND: at least one operand must be FALSE.
- NOT: operand must be TRUE.



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Three-Valued Logic

To understand how AND, OR, and NOT work in 3-valued logic

<https://powcoder.com>

Otherwise

- The result is UNKNOWN

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Example

From the following **Sells** relation:

Bar	Assignment	Project	Exam	Help	price
Joe's Bar	Bud				NULL
		https://powcoder.com			
...	

SELECT Add WeChat powcoder

FROM Sells

WHERE price < 2.00 OR price >= 5.00;



Multi-Relation Queries

Usually a combination of data from multiple (i.e. more than one) relation.

- More often than not, these are interesting queries.

<https://powcoder.com>

We can address several relations in one query by listing them all in the **FROM** clause.

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Distinguish attributes of the same name by “<relation>.<attribute>”.



Example: Joining Two Relations

Using relations: Likes(drinker, beer) and Frequent(drinker, bar), find the beers liked by at least one person who frequents Joe's Bar.

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<https://powcoder.com>

```
SELECT beer  
FROM Likes, Frequent  
WHERE bar = 'Joe''s Bar' AND Frequent.drinker = Likes.drinker;
```

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Example: Joining Two Relations

Alternatively, previously shown on slide #11, we can use explicit (named) tuple variables.

<https://powcoder.com>

```
SELECT beer  
FROM Likes l, Frequents f  
WHERE bar = 'Joe``s Bar' AND f.drinker = l.drinker;
```

Formal Semantics

Almost the same for single-relation queries

- Start with the product of all the relations in the **FROM** clause.
<https://powcoder.com>
- Apply the selection condition from the **WHERE** clause.
- Project onto the list of attributes and expressions in the **SELECT** clause.

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Operational Semantics

Imagine one tuple-variable for each relation in the **FROM** clause.

- These tuple-variables visit each combination of tuples, one from each relation.

<https://powcoder.com>

If the tuple-variables are pointing to tuples that satisfy the **WHERE** clause, send these tuples to the **SELECT** clause.



Operational Semantics

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check for Joe

drinker	bar	drinker	beer
Sally	Joe's	Sally	Bud

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Tuple-variable t_1

Tuple-variable t_2

to output

check these are equal

Explicit Tuple-Variables

Sometimes a query needs to use two copies of the same relation.

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Copies are distinguished by following the relation name by the name of a tuple-variable, in the FROM clause.

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It's always an option to rename relations this way, even when not essential.

Example: Self-Join

From Beers(*name, manf*) find all pairs of beers by the same manufacturer.

- Do not produce pairs like (Bud, Bud).
- Do not produce the same pairs twice (Bud, Miller) and (Miller, Bud).

<https://powcoder.com>

SELECT b1.name, b2.name

FROM Beers b1, Beers b2

WHERE b1.manf = b2.manf AND b1.name < b2.name;

Sub-queries

A parenthesized **SELECT FROM WHERE** statement (subquery) can be used as a value in a number of places, including **FROM** and **WHERE** clauses.

<https://powcoder.com>

Example: in place of a relation in the **FROM** clause, we can use a subquery and then query its result.
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- To do this we must use a tuple-variable to name tuples of the result.



Example: Sub-query in FROM

Find the beers liked by at least one person who frequents Joe's Bar.

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<https://powcoder.com>

```
SELECT beer
FROM Likes (SELECT drinker
              FROM Frequents
              WHERE bar = 'Joe``s Bar') JD
WHERE Likes.drinkers = JD.drinker;
```

Drinkers who frequent Joe's Bar



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Sub-queries Often Obscure Queries

Find the beers liked by at least one person who frequents Joe's Bar.

[Assignment Project Exam Help](https://powcoder.com)
<https://powcoder.com>

```
SELECT beer
FROM Likes l, Frequents f
WHERE l.drinker = f.drinker AND bar = 'Joe``s Bar';
```

Simple Join Query



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Sub-Queries That Return One Tuple

If a sub-query is guaranteed to produce one tuple, then the sub-query can be used as a value.

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<https://powcoder.com>

- Usually, the tuple has one component.
- Remember SQL's 3-valued logic.

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Example: Single-Tuple Sub-query

Using ~~Sells(bar, beer, price)~~ find the bars that serve Miller for the same price Joe charges for Bud.

<https://powcoder.com>

Two queries would work:

- Find the price Joe charges for Bud.
- Find the bars that serve Miller at that price.



Query + Sub-Query Solution

- Find the price Joe charges for Bud.
- Find the bars that serve Miller at that price.
Sells(bar, beer, price)

SELECT bar
FROM Sells

WHERE beer = 'Miller' AND price

The price at which
Joe sells Bud

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```
(SELECT price  
FROM Sells  
WHERE bar = 'Joe ``s Bar' AND  
beer = 'Bud');
```



Query + Sub-Query Solution

```
SELECT bar  
FROM Sells
```

```
WHERE beer = 'Miller' AND price
```

- Find the price Joe charges for Bud.
- Find the bars that serve Miller at that price.

Sells(bar, beer, price)

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```
(SELECT price  
FROM Sells  
WHERE bar = 'Joe ``s Bar' AND  
beer = 'Bud');
```

Questions:

1. What if the price of Bud is NULL?
2. What if the sub-query returns multiple values?

The price at which Joe sells Bud

Temporary Tables

Yes, they do exist! MySQL allows them!

Note: a declared temporary table must be declared!

- `CREATE TEMPORARY TABLE <temp_table_name> ...`

Temporary tables exist in:

- WHERE/FROM clauses, WITH statements, and survive for the duration a single session.
- Single session must be created in a *user temporary space*.

A few useful links for further investigation:

- <https://dev.mysql.com/doc/refman/5.7/en/create-temporary-table.html>



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Recap: Conditions in WHERE Clause

Boolean operators: AND, OR, NOT.

Comparisons: =, <>, <, >, <=, >=.

LIKE operator.

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<https://powcoder.com>

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SQL includes a BETWEEN comparison operator too.

- Let's see an example!



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Example: Between

Find the names of all Instructors with salary BETWEEN \$90,000 and \$100,000.

- i.e. $\geq \$90,000$ and $\leq \$100,000$

SELECT Add WeChat powcoder

FROM Instructor

```
WHERE salary BETWEEN 90000 AND 100000;
```

The Operator: ANY

X = ANY(<subquery>) is a Boolean condition that is TRUE iff x equals at least one tuple in the subquery result.

- = could be any comparison operator

<https://powcoder.com>

Example: $x \geq \text{ANY}(<\text{subquery}>)$ means x is not the uniquely smallest tuple produced by the sub-query.

- NOTE: tuples must have one component only.

The Operator: ALL

$x <> \text{ALL } (\langle \text{subquery} \rangle)$ is true if for every tuple t in the relation, x is not equal to t .

<https://powcoder.com>

$<>$ can be any comparison operator.

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Example: $x \geq \text{ALL } (\langle \text{subquery} \rangle)$ means there is no tuple larger than x in the sub-query result.



Example: ALL

From Sells(bar, beer, price), find the beer(s) sold at the highest price.

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SELECT beer
FROM Sells

WHERE price >= ALL /
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```
SELECT price  
FROM Sells  
);
```

The price from the outer Sells
must not be less than any
price.



The Operator: IN

<value> IN (<subquery>) is true iff the <value> is a member of the relation produced by the sub-query.

- Opposite: <value> NOT IN (<subquery>)

<https://powcoder.com>

IN-expression can appear in the WHERE clauses.

WHERE <column> IN (value1, value2, ..., valueN)



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“IN” is Concise

```
SELECT *  
FROM Cartoons  
WHERE LastName  
      IN ('Jetsons', 'Smurfs', 'Flinstones');
```

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VS.

<https://powcoder.com>

```
SELECT *  
FROM Cartoons  
WHERE LastName = 'Jetsons'  
      OR LastName = 'Smurfs'  
      OR LastName = 'Flinstones';
```

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Example: IN

Using `Beers(name, manf)` and `Likes(drinker, beer)`, find the name and manufacturer of each beer that Fred likes.

```
SELECT *  
FROM Beers
```

```
WHERE name IN (SELECT beer  
FROM Likes  
WHERE drinker = 'Fred');
```

The set of beers that Fred likes.

Another Example: Operator “IN” and “NOT IN”



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Using IN and NOT IN operators with a Multiple-Row Sub-query:

- <https://www.w3resource.com/sql/subqueries/multiple-row-column-subqueries.php>

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IN vs. Join

```
SELECT R.a
```

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```
SELECT R.a
```

```
FROM R, S
```

<https://powcoder.com>

```
WHERE R.b = S.b;
```

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```
WHERE b IN (SELECT b FROM S);
```

Note: IN and JOIN are different queries that can yield different results.
Unless S.b is unique!



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IN vs. Join

Equivalent to:

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<https://powcoder.com>
SELECT R.a
FROM R, S
JOIN (SELECT DISTINCT b
FROM S
)
ON R.b = S.b;

Performance Note: if the joining column is not UNIQUE then IN is faster than JOIN on DISTINCT.



IN is a Predicate About R's Tuples

```
SELECT R.a  
FROM R  
WHERE b IN
```

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<https://powcoder.com>

One loop, over
the tuples of R.

R	
a	b
1	2
3	4

S	
b	c
2	5
2	6

(1,2) satisfies the
condition; 1 is
output once.



This Query Pairs Tuples from R, S

```
SELECT R.a
```

```
FROM R,
```

```
WHERE R.b = S.b;
```

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(1,2) with (2,5) and (1,2) with (2,6) both satisfy the condition; 1 is output twice.

<https://powcoder.com>

Double loop, over the tuples of R and S.

R	
a	b
1	2
3	4

S	
b	c
2	5
2	6



Recall: Original Query

```
SELECT bar  
      FROM Sells  
     WHERE beer = 'Miller' AND  
           price = (SELECT price  
                  FROM Sells  
                 WHERE beer = 'Bud');
```

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Option 1: use IN

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Option 2: use = ANY()

<https://powcoder.com>



RECAP

The IN() operator is equivalent to ANY().

For ANY(), you can use other comparison operators such as:

- >, <, etc... but this is NOT applicable for the IN() operator.
- The ability to use these operators can give you more control in your query depending on your desired output/result.

RECAP

NOTE: the `<>ANY` operator differs from `NOT IN`:

1. `<> ANY` means != (a.k.a. does not equal) any...
 - e.g. `<> ANY` means `!= a or != b or != c ...`
2. `NOT IN` means `!=` (a.k.a. does not equal) any...
 - e.g. `!= a and != b and != c ...`
3. `<> ALL` means the same as `NOT IN`.

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Example: = ANY()

Sells	bar	beer	price
	Jane	Miller	3.00
	Joe	Miller	4.00
	Joe	Bud	3.00
	Jack	Bud	4.00
	Tom	Miller	4.50

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```
SELECT bar
  FROM Sells
 WHERE beer = 'Miller' AND price =
      ANY(SELECT price
          FROM Sells
         WHERE beer = 'Bud');
```

Result	bar
	Jane
	Joe

The Operator: Exists

Exists (<subquery>) is true if the subquery is not empty.

<https://powcoder.com>

Example: From Beers(name, manf), find the beers that are unique (i.e. only) beer made by their respective manufacturer.

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Example: Exists

```
SELECT name  
FROM Beers b1  
WHERE NOT EXISTS (
```

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<https://powcoder.com>

Notice the scope rule:

Manf refers to the closest nested FROM with a relation having that attribute.

NOTE: Some DBMSs consider this to be ambiguous.

Set of beers with the same manf as b1, but not the same beer.

```
SELECT *  
FROM Beers  
WHERE manf = b1.manf AND name <> b1.name
```

);

Notice the SQL “not equals” operator.



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Union, Intersection, and Difference

Union, intersection, and difference of relations are expressed by the following forms, each involving sub-queries:

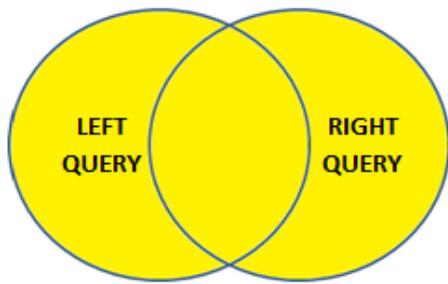
- (<subquery>) UNION (<subquery>)
- (<subquery>) INTERSECTION (<subquery>)
- (<subquery>) EXCEPT (<subquery>)

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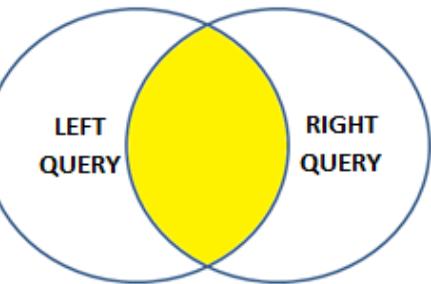
Union, Intersection, and Difference



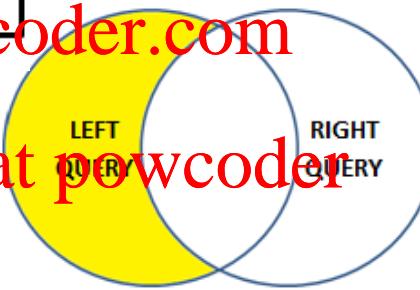
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<https://powcoder.com>

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INTERSECT operator retrieves the common unique rows from both the left and the right query



EXCEPT operator returns unique rows from the left query that aren't in the right query's results

Example: Intersection

Using Likes(drinker, beer), Sells(bar, beer, price) and Frequents(drinker, bar), find the drinkers and beers such that:

- <https://powcoder.com>
1. The drinker likes the beer, and
 2. The drinker frequents at least one bar that sells the beer.

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Example: Intersection – Solution

```
SELECT *  
FROM Likes
```

```
INTERSECT  
    (SELECT drinker, beer
```

```
        FROM Sells, Frequents  
        WHERE Frequents.bar = Sells.bar  
    );
```

The sub-query is really
a stored table!

The drinker frequents a
bar that sells the beer.



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Ordering the Display of Tuples

List in alphabetical order the names of all instructors

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```
SELECT attribute  
      FROM Table  
 ORDER BY attribute <asc/desc>
```

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We may specify **desc** for descending order or **asc** for ascending order, for each attribute.

Note: Ascending order is the default.



Example: Order By

List the names of all instructors in descending alphabetical

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<https://powcoder.com>

```
SELECT name
      FROM Instructor
     ORDER BY name;
```

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```
SELECT name
      FROM Instructor
     ORDER BY name desc;
```

Bag Semantics

A *bag* (or *multiset*) is like a set, but an element may appear more than once.

<https://powcoder.com>

Example: {1,2,1,3} is a bag.

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Example: {1,2,3} is also a bag that happens to be a set.

Bag (multi-Set Semantics)

SQL primarily uses bags semantics.

The SELECT-FROM-WHERE statement uses bag semantics.

- Originally for efficiency reasons.

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The default for union, intersection, and difference is set semantics.

- That is, duplicates are eliminated as the operation is applied.

Motivation: Efficiency

When doing projection, it is easier to avoid eliminating duplicates.

- Work on one tuple-at-a-time.

<https://powcoder.com>

For intersection or difference, it is most efficient to sort the relations first.

- At that point you may as well eliminate the duplicates anyway.

Control Duplicate Elimination

Force the result to be a set by SELECT DISTINCT

<https://powcoder.com>

Force the results to be a bag (i.e. don't eliminate duplicates) by the ALL operator

i.e. ... UNION ALL ...

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Example: DISTINCT

From ~~Sells~~**Assignment Project Exam Help**, find all the different price charges for beers:

```
SELECT DISTINCT price  
      https://powcoder.com  
   FROM Sells;
```

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Notice that without DISTINCT, each price would be listed as many times as there were bar/beer pairs at that price.



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Example: ALL

Using the relations (LikesDrinker, bar) and FrequentsDrinker, bar):

- List drinkers who frequent more bars than they like beers, and do so as many times as <https://powcoder.com>

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EXCEPT ALL

(SELECT drinker FROM Likes);

Let's Add Some HUMOUR!

A SQL query was sent to a database and approached two values. The SQL query proceeds to ask “can I join you?”

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Database Modifications

A modification command does not return a result (as a query does), but changes the database in some way.

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<https://powcoder.com>

Three types of modifications are:

1. **Insert** → inserting a tuple or tuples.
2. **Delete** → deleting a tuple or tuples.
3. **Update** → updating the value(s) of an existing tuple or tuples.

Insertion

To insert a single tuple:

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INSERT INTO <relation>
VALUES (<list_of_values>);
<https://powcoder.com>

Example: add to Likes(drinker, beer)

INSERT INTO Likes
VALUES ('Sally', 'Bud');

Specifying Attributes in INSERT

We may add to the relation name a list of attributes:

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Two reasons to do so:

1. We forget the standard order of attributes for the relation.
2. We don't have values for all attributes, and we want the system to fill in missing components with NULL or a default value.



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Example: Specifying Insert Attributes

Another way to add the statement Sally likes Bud to Likes(drinker, beer).

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INSERT INTO Likes (beer, drinker)
VALUES ('Bud', 'Sally');

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Adding Default Values

In a CREATE TABLE statement, we can follow an attribute by DEFAULT and a value.

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When an inserted tuple has no value for that attribute, the default value will be used.

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Example: Default Values

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```
CREATE TABLE Drinkers (
    name CHAR(30) PRIMARY KEY,
    https://powcoder.com
    addr CHAR(50) DEFAULT '123 Main St.',
    phone CHAR(10)
);
```



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Example: Default Values Continued

```
INSERT INTO Drinkers(name)  
VALUES ('Sally');
```

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Result:

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name	address	phone
Sally	123 Main St.	NULL



Insert Many Tuples

We may insert the entire result of a query into a relation, using the form:

<https://powcoder.com>
INSERT INTO <relation>

(<subquery>),
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Example: Insert a SubQuery

Using ~~FrequentDrinker~~, enter into the new relation **Buddies(name)** all of Sally's "potential buddies".

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i.e. The drinkers who frequent at least one bar that Sally also frequents.

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INSERT INTO Buddies

(SELECT);



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Result

The other drinker

INSERT INTO BUDDIES

(SELECT d2.drinker

<https://powcoder.com>

FROM Frequent d1, Frequent d2

WHERE d1.drinker = 'Sally' AND d2.drinker <> 'Sally' AND

d1.bar = d2.bar

);

Pairs of drinker tuples where the first is for "Sally", the second is for someone else, and the bars are the same.



Deletion

To delete tuples satisfying a condition from some relation:

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<https://powcoder.com>

DELETE FROM <relation>
WHERE <condition>

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Example: Deletion

Delete from Likes (Assignment Project Exam Help) the tuple stating that Sally likes Bud.

<https://powcoder.com>
DELETE FROM Likes
WHERE drinker = 'Sally' AND beer = 'Bud';
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Example: Delete all Tuples

Alternatively you can make the relation Likes empty.

<https://powcoder.com>
DELETE FROM Likes;

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Note: No WHERE clause is required.



Example: Delete Some Tuples

Delete from `Beers(name, manf)` all beers for which there is another beer by the same manufacturer.

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```
DELETE FROM Beers b  
WHERE EXISTS(  
    SELECT name  
    FROM Beers  
    WHERE manf = b.manf AND name <> b.name  
);
```

Beers with the same manufacturer and a different name from the name of the beer represented by tuple b .



Semantics of Deletion

Suppose Anheuser-Busch makes only Bud and Bud Lite.

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Suppose we come to the tuple b for Bud first.

<https://powcoder.com>

The sub-query is non-empty, because of the Bud Lite tuple, so we delete

Bud. **Add WeChat powcoder**

Now, when b is the tuple for Bud Lite, do we delete that tuple too?

We do delete Bud Lite as well!

Let's see how!

Semantics of Deletion

Answer: Yes, we will delete Bud Lyle as well.

The deletion proceeds in two stages.
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1. Mark all tuples for which the WHERE condition is satisfied.
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2. Delete the marked tuples.



Updates

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To change certain attributes in certain tuples of a relation:

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UPDATE <relation>

SET <list of attribute assignments>

WHERE <condition on tuples>;



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Example: Updates

Change drinker Fred's phone number to 555-1234.

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<https://powcoder.com>

UPDATE Drinkers

SET phone = '555-1234'
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WHERE name = 'Fred';



Example: Update Several Tuples

Make \$4 the maximum price for paper

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<https://powcoder.com>

UPDATE Sells
SET price = 4.00
WHERE price > 4.00;

Questions?



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Q & A
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THANKS FOR LISTENING
I'LL BE ANSWERING QUESTIONS NOW



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Citations, Images and Resources

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