

## SQL Session 3



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SQL IN 100 DAYS

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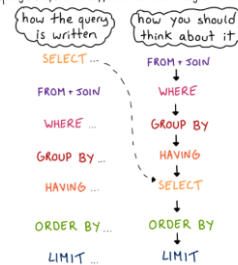
- ▶ Subqueries
- ▶ DDL Command

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## Subqueries

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The query's steps don't happen in the order they're written:

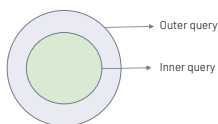


(In reality query execution is much more complicated than this. There are a lot of optimizations.)

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## Introduction

A subquery is a **SELECT** statement that is nested within another statement. The subquery is also called the inner query or nested query.



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## Syntax

```

1 SELECT column_name
2 FROM table_1, table_2
3 WHERE column_name OPERATOR (
4     SELECT column_name
5     FROM table_1, table_2);
6

```

Outer query or enclosing query

Inner query, nested query or subquery

- Subqueries are nested queries that provide data to the enclosing query.
- Subqueries can return individual values or a list of records
- Subqueries must be enclosed with parentheses

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## Types of Subqueries

There are two main types of subqueries:

- Single-row subqueries
- Multiple-row subqueries

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## Single-row Subqueries

Single-row subqueries return one row with only one column and are typically used with single-row operators such as =, >, >=, <=, <>, != especially in WHERE clause.

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## Example

Find the employees who get paid more than Rodney Weaver

emp_id	first_name	last_name	salary	job_title	gender	hire_date
1	17679	Robert	110000	Operations Director	Male	2018-09-04
2	26650	Elin	88000	Sales Manager	Male	2017-11-24
3	30840	David	85000	Data Scientist	Male	2019-12-02
4	49714	Hugo	55000	IT Support Specialist	Male	2019-11-02
5	11821	Linda	95000	Data Scientist	Female	2019-09-29
6	67233	Lisa	75000	Business Analyst	Female	2019-09-09
7	76589	Jason	99000	Project Manager	Male	2019-01-21
8	71329	Gavle	75000	HR Manager	Female	2019-06-28
9	76589	Jason	99000	Project Manager	Male	2019-01-21
10	97927	Billie	67000	Web Developer	Female	2018-06-25

query:

```
1 SELECT first_name, last_name, salary
2 FROM employees
3 WHERE salary >
4 (SELECT salary
5 FROM employees
6 WHERE first_name = "Rodney");
```

output:

```
1 first_name last_name salary
2 -----
3 Robert 110000
4 Linda 95000
5 Jason 99000
```

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## Analyze the query-1

```
1 SELECT first_name, last_name, salary
2 FROM employees
3 WHERE salary >
4 (SELECT salary
5 FROM employees
6 WHERE first_name = "Rodney");
```

emp_id	first_name	last_name	salary	job_title	gender	hire_date
1	17679	Robert	110000	Operations Director	Male	2018-09-04
2	26650	Elin	88000	Sales Manager	Male	2017-11-24
3	30840	David	85000	Data Scientist	Male	2019-12-02
4	49714	Hugo	55000	IT Support Specialist	Male	2019-11-02
5	11821	Linda	95000	Data Scientist	Female	2019-09-29
6	67233	Lisa	75000	Business Analyst	Female	2019-09-09
7	76589	Jason	99000	Project Manager	Male	2019-01-21
8	71329	Gavle	75000	HR Manager	Female	2019-06-28
9	76589	Jason	99000	Project Manager	Male	2019-01-21
10	97927	Billie	67000	Web Developer	Female	2018-06-25

- The inner query is executed first and returns 87000 which is the salary of Rodney.

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## Analyze the query-2

emp_id	first_name	last_name	salary	job_title	gender	hire_date
1	17679	Robert	110000	Operations Director	Male	2018-09-04
2	26650	Elin	88000	Sales Manager	Male	2017-11-24
3	30840	David	85000	Data Scientist	Male	2019-12-02
4	49714	Hugo	55000	IT Support Specialist	Male	2019-11-02
5	11821	Linda	95000	Data Scientist	Female	2019-09-29
6	67233	Lisa	75000	Business Analyst	Female	2019-09-09
7	76589	Jason	99000	Project Manager	Male	2019-01-21
8	71329	Gavle	75000	HR Manager	Female	2019-06-28
9	76589	Jason	99000	Project Manager	Male	2019-01-21
10	97927	Billie	67000	Web Developer	Female	2018-06-25

```
2 SELECT first_name, last_name, salary
3 FROM employees
4 WHERE salary >
5 (SELECT salary
6 FROM employees
7 WHERE first_name = "Rodney");
```

- The inner query is executed first and returns 87000 which is the salary of Rodney.
- The value 87000 is passed to the outer query, in particular to the WHERE clause.

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## Analyze the query-3

emp_id	first_name	last_name	salary	job_title	gender	hire_date
1	17679	Robert	110000	Operations Director	Male	2018-09-04
2	26650	Elin	88000	Sales Manager	Male	2017-11-24
3	30840	David	85000	Data Scientist	Male	2019-12-02
4	49714	Hugo	55000	IT Support Specialist	Male	2019-11-02
5	11821	Linda	95000	Data Scientist	Female	2019-09-29
6	67233	Lisa	75000	Business Analyst	Female	2019-09-09
7	76589	Jason	99000	Project Manager	Male	2019-01-21
8	71329	Gavle	75000	HR Manager	Female	2019-06-28
9	76589	Jason	99000	Project Manager	Male	2019-01-21
10	97927	Billie	67000	Web Developer	Female	2018-06-25

```
2 SELECT first_name, last_name, salary
3 FROM employees
4 WHERE salary > 87000
5 (SELECT salary
6 FROM employees
7 WHERE first_name = "Rodney");
```

- The inner query is executed first and returns 87000 which is the salary of Rodney.
- The value 87000 is passed to the outer query, in particular to the WHERE clause.

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## Multiple-row Subqueries

Multiple-row subqueries return sets of rows and are used with multiple-row operators such as **IN**, **NOT IN**, **ANY**, **ALL**.



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## Example

Find the employees (first name, last name from employees table) who work under the Operations department (departments table)

Query:

```
1 SELECT first_name, last_name
2 FROM employees
3 WHERE emp_id IN
4   (SELECT emp_id
5    FROM departments
6    WHERE dept_name = 'Operations');
```

Output:

```
1 first_name last_name
2 -----
3 Robert    Gilmore
4 David     Barrow
5 Linda     Foster
6 Jason     Christian
7
```

emp_id	first_name	last_name	salary	job_title	gender	hire_date
1	17679	Robert	12000	Operations Director	Male	2010-09-04
2	26650	David	8500	Sales Manager	Male	2017-11-24
3	30840	David	8500	Data Scientist	Male	2019-12-02
4	49714	Jason	5500	IT Support Specialist	Male	2019-11-02
5	51821	Linda	9500	Data Scientist	Female	2019-04-26
6	67323	Lisa	7500	Business Analyst	Female	2019-08-09
7	70930	Rodney	8700	Project Manager	Male	2019-12-20
8	71129	Gayle	7700	HR Manager	Female	2019-06-28
9	76589	Jason	8500	Project Manager	Male	2019-01-11
10	97927	Mike	6700	Web Developer	Female	2019-06-25

emp_id	dept_name	dept_id
1	17679	Operations
2	26650	Marketing
3	30840	Operations
4	49823	Technology
5	51821	Operations
6	67323	Marketing
7	71129	Administrative
8	76589	Operations
9	97927	Technology

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## Analyze the query-1

emp_id	dept_name	dept_id
1	17679 Operations	13
2	26650 Marketing	14
3	30840 Operations	13
4	49823 Technology	12
5	51821 Operations	13
6	67323 Marketing	14
7	71119 Administrative	11
8	76589 Operations	13
9	97927 Technology	12

- The inner query returns the employees ids who work under the Operations department

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## Analyze the query-2

emp_id	dept_name	dept_id
1	17679 Operations	13
2	26650 Marketing	14
3	30840 Operations	13
4	49823 Technology	12
5	51821 Operations	13
6	67323 Marketing	14
7	71119 Administrative	11
8	76589 Operations	13
9	97927 Technology	12

- The inner query returns the employees ids who work under the Operations department
- Employees ids are passed to the outer query.

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## Analyze the query-3

emp_id	dept_name	dept_id
1	17679 Operations	13
2	26650 Marketing	14
3	30840 Operations	13
4	49823 Technology	12
5	51821 Operations	13
6	67323 Marketing	14
7	71119 Administrative	11
8	76589 Operations	13
9	97927 Technology	12

- The inner query returns the employees ids who work under the Operations department
- Employees ids are passed to the outer query.

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## Analyze the query-4

emp_id	first_name	last_name	salary	job_title	gender	hire_date
1	17679	Robert	12000	Operations Director	Male	2010-09-04
2	26650	David	8500	Sales Manager	Male	2017-11-24
3	30840	David	8500	Data Scientist	Male	2019-12-02
4	49714	Jason	5500	IT Support Specialist	Male	2019-11-02
5	51821	Linda	9500	Data Scientist	Female	2019-04-26
6	67323	Lisa	7500	Business Analyst	Female	2019-08-09
7	70930	Rodney	8700	Project Manager	Male	2019-12-20
8	71129	Gayle	7700	HR Manager	Female	2019-06-28
9	76589	Jason	8500	Project Manager	Male	2019-01-11
10	97927	Mike	6700	Web Developer	Female	2019-06-25

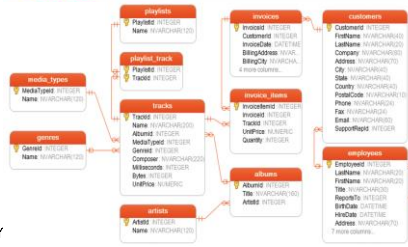
output:

```
1 first_name last_name
2 -----
3 Robert    Gilmore
4 David     Barrow
5 Linda     Foster
6 Jason     Christian
7
```

Outer query filters those employees ids and returns their first name and last name as a result set.

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Retrieve track id, track name, album id info of the Album title 'Faceless' and 'Let There Be Rock'



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## Introduction

### SQL Statements

- DDL - Data Definition Language
- DML - Data Manipulation Language
- DCL - Data Control Language
- TCL - Transaction Control Language

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## DDL Commands

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## Table of Contents

- ▶ Introduction
- ▶ Data Types
- ▶ CREATE TABLE
- ▶ ALTER TABLE
- ▶ DROP TABLE

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## Data Definition Language

- DDL specifies the database schema.
- Some statements used in DDL are **CREATE, ALTER, DROP**.
- DDL statements are typically used to set up and configure a new database before we insert data.

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## Data Manipulation Language

- Data Manipulation Language (DML) enables users to access or manipulate data.
- INSERT, UPDATE, DELETE, SELECT\*** are the statements used in DML.

\* In some sources, SELECT statement is grouped into a different category called DQL (Data Query Language).

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## ▶ Data Control Language ▶▶

- Data Control Language (DCL) is used to grant or revoke access control.
- Its statements are **REVOKE** and **GRANT**.

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## ▶ Transaction Control Language ▶▶

- Transaction Control Language (TCL) controls the transactions of DML and DDL commands.
- Some statements in TCL are **COMMIT**, **ROLLBACK**, **SAVEPOINT**.

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## 2 ▶ Data Types ▶▶

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## ▶ Data Types ▶▶

The data type of a column defines what value the column can hold: integer, character, date and time, binary, and so on.

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## ▶ Data Types ▶▶

String

Date and Time

Numeric

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## ▶ String Data Types ▶▶

The string data types are:

- CHAR
- VARCHAR
- BINARY
- VARBINARY
- BLOB
- TEXT
- ENUM
- SET

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## Date and Time Data Types

The date and time data types are:

- DATE
- DATETIME
- TIMESTAMP
- YEAR

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## Numeric Data Types

### Integer Types (Exact Value)

- INTEGER or INT
- SMALLINT
- TINYINT
- MEDIUMINT
- BIGINT

### Floating-Point Types (Approximate Value)

- FLOAT
- DOUBLE

### Fixed-Point Types (Exact Value)

- DECIMAL
- NUMERIC

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## Data Types

**PRO  
TIP**

Data types might have different names in different database. And even if the name is the same, the size and other details may be different! Always check the documentation!

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## 3 CREATE TABLE

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## CREATE TABLE

When creating a table, we use **CREATE TABLE** statement.

### Syntax of a Basic Create Table Statement

```
CREATE TABLE table_name
(column_name1 data_type,
column_name2 data_type);
```

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## CREATE TABLE-Example

```
CREATE TABLE employee
(first_name VARCHAR(15),
last_name VARCHAR(20),
age INT,
hire_date DATE);
```

**Note:** Values in VARCHAR columns are variable-length strings. The length can be specified as a value from 0 to 65,535.

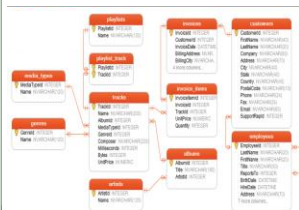
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## Query Time

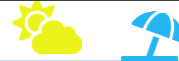
Please add a table to your existing chinook database. The table name will be **leaves** we will use it to keep record of the employees' annual or sick leaves

Column names:

- id
- employee\_id
- start\_date
- end\_date



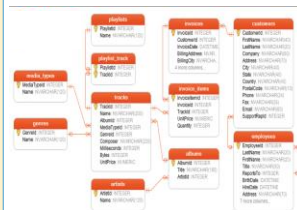
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Please add a table to your existing sql\_course database. The table name will be **vacation\_plan** of the employees for this summer.

Column names:

- place\_id
- country
- hotel\_name
- employee\_id
- vacation\_length
- budget



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## DROP TABLE

The DROP TABLE statement is used to drop an existing table in a database.

Syntax:

```
DROP TABLE table_name;
```

```
TRUNCATE TABLE table_name;
```

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## INSERT INTO

Syntax:

```
INSERT INTO table_name (column1, column2 ,...)
VALUES (value1, value2 ,...);
```

```
INSERT INTO table1 (column1,column2 ,...)
VALUES
(value1,value2 ,...),
(value1,value2 ,...),
...
(value1,value2 ,...);
```

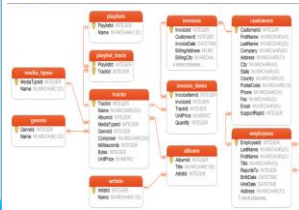


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## Query Time

INSERT a record for an employee into leaves table

```
id INT,
employee_id INT,
start_date DATE,
end_date DATE
```



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## Constraints

Constraints are the rules specified for data in a table. We can limit the type of data that will go into a table with the constraints. We can define the constraints with the **CREATE TABLE** statement or **ALTER TABLE** statement.

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## Constraints

Constraints	
Constraint Name	Definition
NOT NULL	Ensures that a column cannot have a NULL value
DEFAULT	Sets a default value for a column when no value is specified
UNIQUE	Ensures that all values in a column are different
PRIMARY KEY	Uniquely identifies each row in a table
FOREIGN KEY	Uniquely identifies a row/record in another table

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## Primary Key

The primary key is a column in our table that makes each row (aka, record) unique.

### Syntax

```
1 CREATE TABLE table_name(
2   column_1 INT PRIMARY KEY,
3   column_2 TEXT,
4   ...
5 );
```

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## Primary Key

### Syntax (Alternative)

```
1 CREATE TABLE table_name(
2   column_1 INT,
3   column_2 TEXT,
4   ...
5   PRIMARY KEY (column_1)
6 );
```

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## Foreign Key

Foreign key is a column in a table that uniquely identifies each row of another table. That column refers to a primary key of another table. This creates a kind of link between the tables.

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## Foreign Key

### customers

```
1 CREATE TABLE customers (customer_id INT PRIMARY KEY,
2   first_name TEXT,
3   second_name TEXT);
4
```

### orders

```
1 CREATE TABLE orders (
2   order_id INT PRIMARY KEY,
3   order_number INT,
4   customer_id INT,
5   FOREIGN KEY (customer_id)
6   REFERENCES customers (customer_id)
7 );
8
```

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## Query Time

Try to insert a record in albums table with an ArtistID=10000 and AlbumID=347



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## Not Null

A column can include NULL values. A NULL value is a special value that means the value is unknown or does not exist.

All columns (except primary key's column) in a table can hold NULL values unless we explicitly specify **NOT NULL** constraints.

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## Not Null

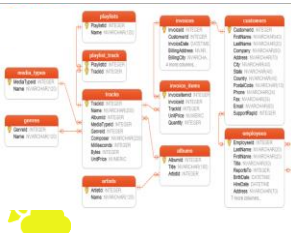
### Syntax

```
1 CREATE TABLE table_name (
2   column_name type_name NOT NULL,
3   ...);
4
```

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## Query Time

Try to insert a record in albums table without a title value



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Please drop the table as you've just created writing

**DROP TABLE vacation\_plan;**  
Then, recreate the vacation\_plan table adding constraints as below:

Column names:

- place\_id -> PRIMARY KEY
- country
- hotel\_name -> NOT NULL
- employee\_id -> FOREIGN KEY
- vacation\_length
- budget

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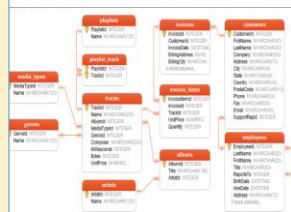
## Query Time

Please drop the table as you've just created writing

**DROP TABLE leaves;**  
Then, recreate the leaves table adding constraints as below:

Column names:

- id -> PRIMARY KEY, AUTOINC
- employee\_id -> FOREIGN KEY
- start\_date -> NOT NULL
- end\_date -> NOT NULL



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## 4 ALTER TABLE

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## ALTER TABLE

The **ALTER TABLE** statement is used to add, delete, or modify columns in an existing table. It is also used to add and drop various constraints on an existing table.

To add a column in a table, use the following syntax:

```
ALTER TABLE table_name
ADD column_name data_type;
```

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Add a column to your vacation\_plan table named "city".

```
ALTER TABLE table_name
ADD column_name data_type;
```

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## ALTER TABLE

To delete a column in a table, use the following syntax:

```
ALTER TABLE table_name
DROP column_name;
```

To change the data type of a column in a table, use the following syntax:

```
ALTER TABLE table_name
MODIFY COLUMN column_name data_type;
```

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Drop the city column from vacation\_plan table.

```
ALTER TABLE table_name
DROP column_name;
```

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## Query Time

Alter the table name to employee\_leaves first. (Google this one know if you don't know)

Then add a column to your leaves table named "leave\_type".

We will use type of leaves such as "annual leave", "sick leave" and etc.



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## Query Time

INSERT 3 new records to employee\_leaves table.

You can use "annual\_leave", "sick\_leave" and etc for leave type



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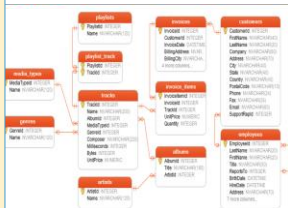
## Query Time

Now add another table  
leave\_types with

id -> PK AUTOINC  
leave\_name -> TEXT

And make the column in  
employee\_leaves table as  
FOREIGN KEY

ADD 3 records to leave\_types  
and employee\_leaves table



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## ALTER TABLE

To delete a column in a table, use the following syntax:

```
ALTER TABLE table_name
DROP column_name;
```

To change the data type of a column in a table, use the following syntax:

```
ALTER TABLE table_name
MODIFY COLUMN column_name data_type;
```

\*Not works in SQLite but you can use them in other RDBMS

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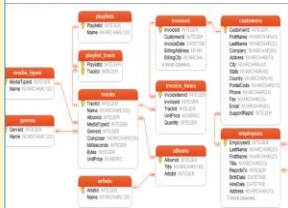
## Query Time

Copy the entire table to a new  
table using csv import method

drop a column (you can't!)

change data type of a column

drop table



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## UPDATE TABLE

```
UPDATE table
SET column_1 = new_value_1,
    column_2 = new_value_2
WHERE
    search_condition
```

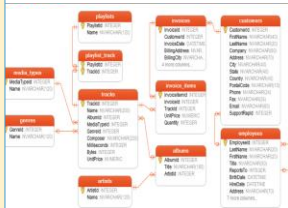
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## Query Time

Change the name of Annual leave to  
Marriage Leave in leave\_types table

Change the start and end date  
values of a record in  
employee\_leaves table

google sqlite date add



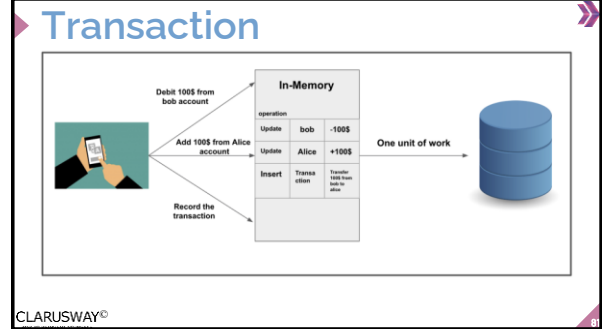
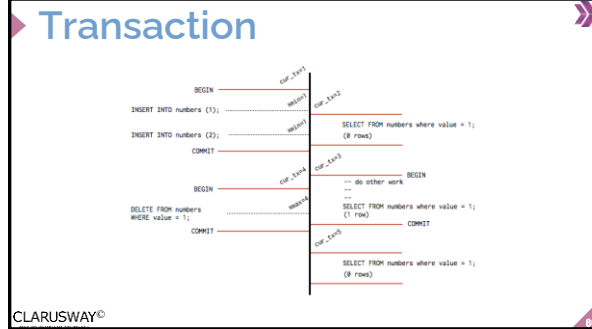
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## DELETE

```
DELETE FROM table
WHERE search_condition;
```

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## Transaction

```
mysql_connect("localhost","username","password");
mysql_select_db("db_name");
//transaction beginning
mysql_query("BEGIN");
//query preparing
$query1 = mysql_query("UPDATE akbank SET account = account - 10000 WHERE account_no = '625027'");
$query2 = mysql_query("UPDATE garanti SET account = account + 10000 WHERE account_no = '124500'");
if (!$query1 or !$query2) {
    ("ROLLBACK");
}
else {
    ("COMMIT");
}
```

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## Trigger

```
CREATE [or REPLACE] TriggerName
[ BEFORE | AFTER ]
[ DELETE | INSERT | UPDATE [of ColumnName] ]
ON [User.]TableName
[ FOR EACH ROW ] [ WHEN Condition ]
BEGIN
    [PL/SQL Block]
END ;
```

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