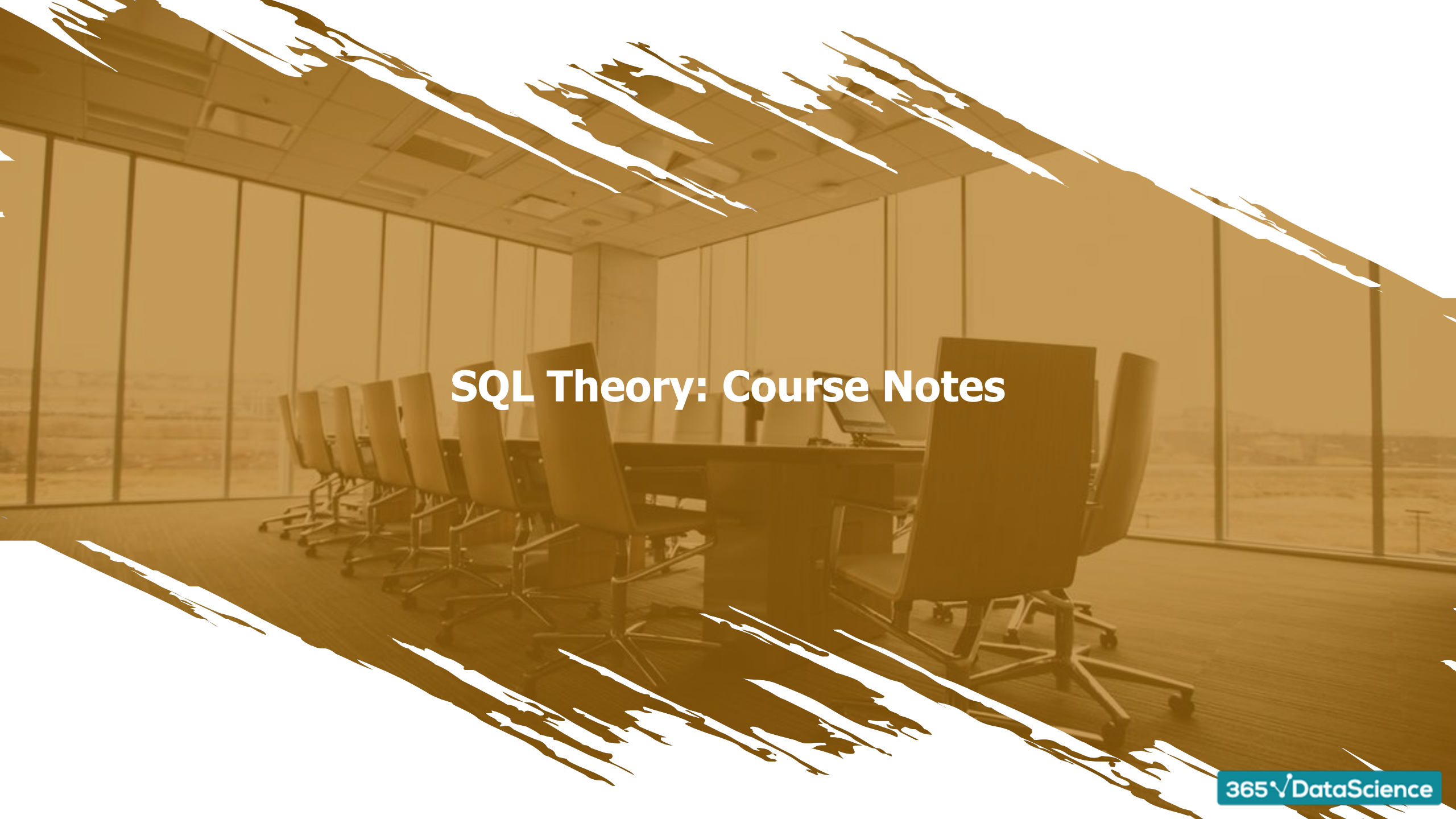

SQL Theory: Course Notes

365 DataScience

Data Definition Language (DDL)

Data Definition Language

- SQL's syntax

Data Definition Language

- **SQL's syntax**

  comprises several types of statements that allow you to perform various commands and operations

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  - a syntax
  - a set of statements that allow the user to define or modify data structures and objects, such as tables

Data Definition Language

- **SQL's syntax**

  comprises several types of statements that allow you to perform various commands and operations

- **Data Definition Language (DDL)**

  - a syntax
  - a set of statements that allow the user to define or modify data structures and objects, such as tables

- **the CREATE statement**

Data Definition Language

- **SQL's syntax**

  comprises several types of statements that allow you to perform various commands and operations

- **Data Definition Language (DDL)**

  - a syntax
  - a set of statements that allow the user to define or modify data structures and objects, such as tables

- **the CREATE statement**

  used for creating entire databases and database objects as tables

Data Definition Language

the CREATE statement

used for creating entire databases and database objects as tables


```
CREATE object_type object_name;
```

Data Definition Language

the CREATE statement

used for creating entire databases and database objects as tables

SQL

```
CREATE object_type object_name;

CREATE TABLE object_name (column_name data_type);
```

Data Definition Language


```
CREATE TABLE object_name (column_name data_type);
```

Data Definition Language

SQL

```
CREATE TABLE object_name (column_name data_type);
```

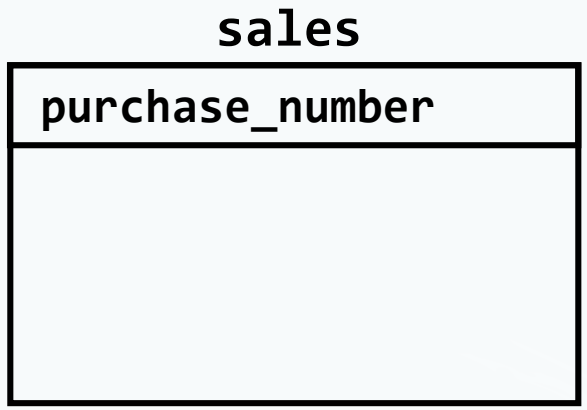
```
CREATE TABLE sales (purchase_number INT);
```

Data Definition Language

SQL

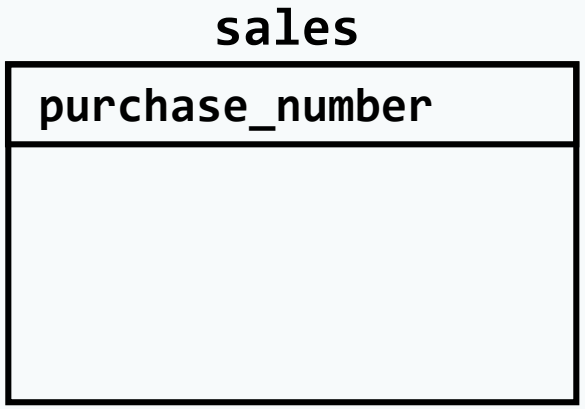
```
CREATE TABLE object_name (column_name data_type);
```

```
CREATE TABLE sales (purchase_number INT);
```



Data Definition Language


```
CREATE TABLE sales (purchase_number INT);
```



- the table name can coincide with the name assigned to the database

Data Definition Language

- the ALTER statement

Data Definition Language

- **the ALTER statement**

  used when altering existing objects

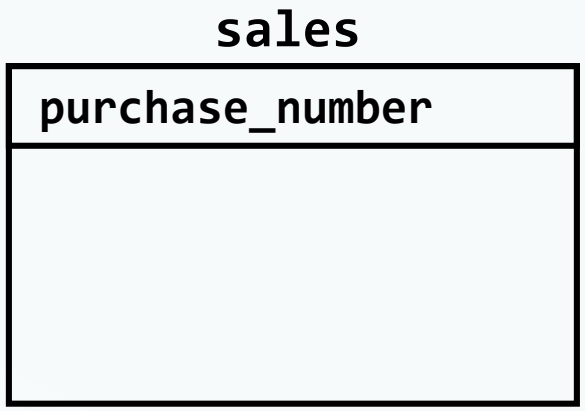
Data Definition Language

- the ALTER statement

  used when altering existing objects

- ADD
- REMOVE
- RENAME

Data Definition Language



Data Definition Language


```
ALTER TABLE sales
ADD COLUMN date_of_purchase DATE;
```

sales

purchase_number

Data Definition Language


```
ALTER TABLE sales
ADD COLUMN date_of_purchase DATE;
```

sales

purchase_number	date_of_purchase

Data Definition Language

- the DROP statement

Data Definition Language

- **the DROP statement**

  used for deleting a database object

Data Definition Language


```
DROP object_type object_name;
```

customers

customer_id	first_name

Data Definition Language

used for deleting a database object

```
DROP object_type object_name;
```

SQL

```
DROP TABLE customers;
```

customers

customer_id	first_name

Data Definition Language

used for deleting a database object

```
DROP object_type object_name;
```

SQL

```
DROP TABLE customers;
```

customers

customer_id	first_name

Data Definition Language

- the RENAME statement

Data Definition Language

- **the RENAME statement**

  allows you to rename an object

Data Definition Language


```
RENAME object_type object_name TO new_object_name;
```

customers

customer_id	first_name

Data Definition Language


```
RENAME object_type object_name TO new_object_name;
```

```
RENAME TABLE customers TO customer_data;
```

customers

customer_id	first_name

Data Definition Language


```
RENAME object_type object_name TO new_object_name;
```

```
RENAME TABLE customers TO customer_data;
```

customer_id	first_name

Data Definition Language

used for deleting a database object


```
RENAME object_type object_name TO new_object_name;
```

```
RENAME TABLE customers TO customer_data;
```

customer_data

customer_id	first_name

Data Definition Language

- the TRUNCATE statement

Data Definition Language

- **the TRUNCATE statement**

  instead of deleting an entire table through DROP, we can also remove its data and continue to have the table as an object in the database

Data Definition Language


```
TRUNCATE object_type object_name;
```

customers

customer_id	first_name

Data Definition Language

used for deleting a database object

SQL

```
TRUNCATE object_type object_name;
```

```
TRUNCATE TABLE customers;
```

customers

customer_id	first_name

Data Definition Language

used for deleting a database object


```
TRUNCATE object_type object_name;
```

```
TRUNCATE TABLE customers;
```

customers

customer_id	first_name

Data Definition Language

- Data Definition Language (DDL)

Data Definition Language

Data Definition Language (DDL)

- CREATE
- ALTER
- DROP
- RENAME
- TRUNCATE

SQL Keywords

Keywords

Keywords:

- ADD

Keywords

Keywords:

- ADD
- CREATE
- ALTER
- etc.

Keywords

Keywords:

- ADD
- CREATE
- ALTER
- etc.

KEYWORDS IN SQL CANNOT BE VARIABLE NAMES!

Keywords

Keywords:

- ADD
- CREATE
- ALTER
- etc.

KEYWORDS IN SQL CANNOT BE VARIABLE NAMES!

objects or databases cannot have names that coincide with SQL keywords

Keywords

- **CREATE, ALTER:**

Keywords

CREATE, ALTER:

SQL

```
CREATE TABLE alter (purchase_number INT);
```

alter

purchase_number

Data Definition Language

- ADD

Data Definition Language

ADD


```
ALTER TABLE sales
ADD COLUMN date_of_purchase DATE;
```

sales

purchase_number	date_of_purchase

Data Definition Language

ADD, ALTER


```
ALTER TABLE sales
ADD COLUMN date_of_purchase DATE;
```

sales

purchase_number	date_of_purchase

Keywords

- Keywords = reserved words

Keywords

- **Keywords = reserved words**

  they cannot be used when naming objects

Data Manipulation Language (DML)

Data Manipulation Language

- **Data Manipulation Language (DML)**

  its statements allow us to manipulate the data in the tables of a database

- **the SELECT statement**

  used to retrieve data from database objects, like tables

Data Manipulation Language


```
SELECT * FROM sales;
```

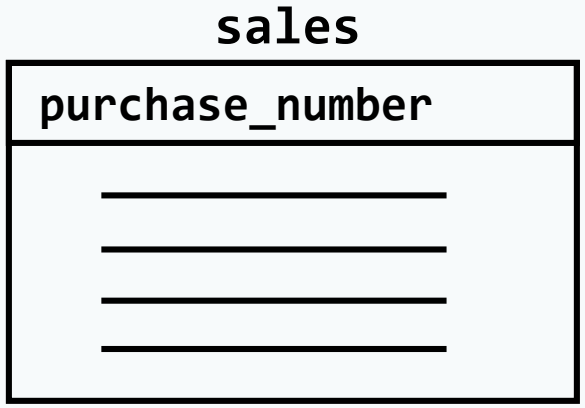
sales

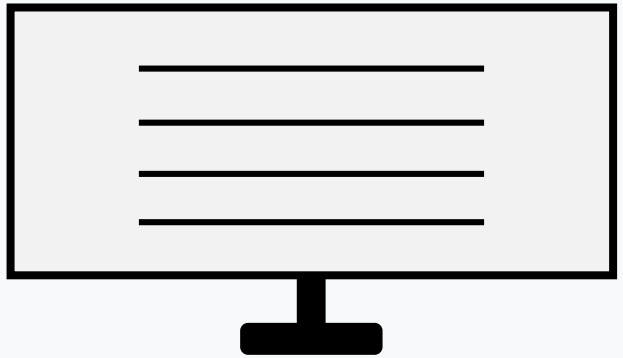
purchase_number

Data Manipulation Language

SQL

```
SELECT * FROM sales;
```





Data Manipulation Language

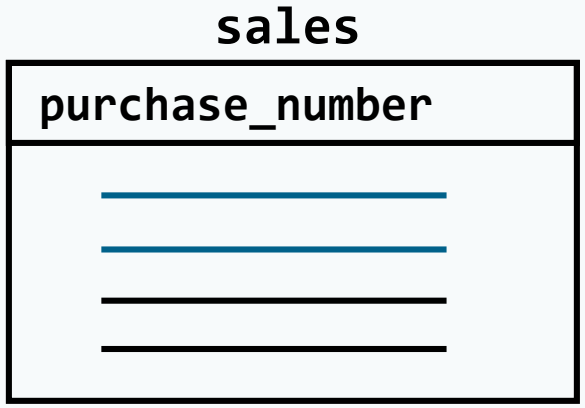

```
SELECT… FROM sales;
```

sales

purchase_number

Data Manipulation Language

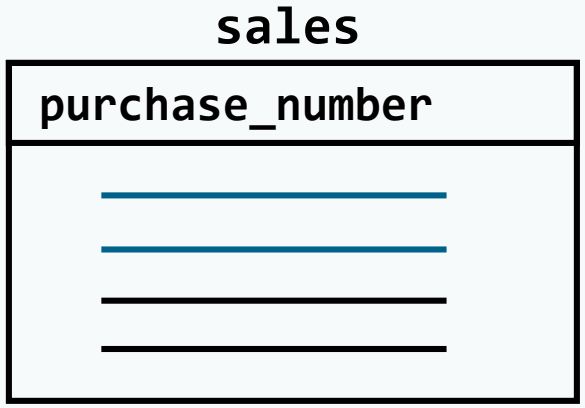

```
SELECT… FROM sales;
```

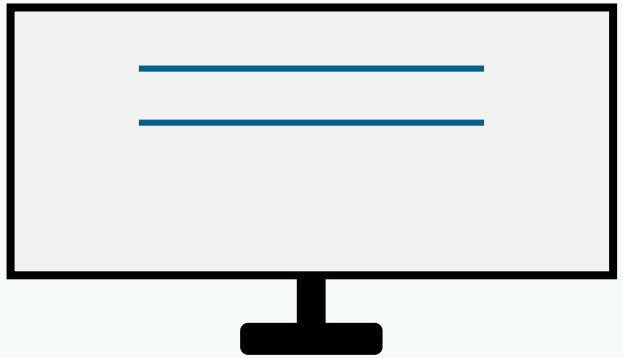


Data Manipulation Language

SQL

```
SELECT… FROM sales;
```





Data Manipulation Language

Why are we going to need just a piece of the table?

- imagine a table with 2 million rows of data
- it can be helpful if you could extract only a portion of the table that satisfies given criteria
- you should know how to use SELECT perfectly well

Data Manipulation Language

- the INSERT statement

  used to insert data into tables

- INSERT INTO… VALUES…;

Data Manipulation Language


```
INSERT INTO sales (purchase_number, date_of_purchase) VALUES
(1, ‘2017-10-11’);
```

sales

purchase_number	date_of_purchase

Data Manipulation Language


```
INSERT INTO sales (purchase_number, date_of_purchase) VALUES
(1, '2017-10-11');
```

sales

purchase_number	date_of_purchase
1	2017-10-11

Data Manipulation Language


```
INSERT INTO sales VALUES
(1, '2017-10-11');
```

sales

purchase_number	date_of_purchase
1	2017-10-11

Data Manipulation Language


```
INSERT INTO sales (purchase_number, date_of_purchase) VALUES
(1, ‘2017-10-11’);


INSERT INTO sales VALUES
(1, ‘2017-10-11’);
```

Data Manipulation Language


```
INSERT INTO sales (purchase_number, date_of_purchase) VALUES
(2, '2017-10-27');
```

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language

- **the UPDATE statement**

  allows you to renew existing data of your tables

Data Manipulation Language

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language


```
UPDATE sales
SET date_of_purchase = ‘2017-12-12’
WHERE purchase_number = 1;
```

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language


```
UPDATE sales
SET date_of_purchase = ‘2017-12-12’
WHERE purchase_number = 1;
```

sales

purchase_number	date_of_purchase
1	2017-12-12
2	2017-10-27

Data Manipulation Language

- **the DELETE statement**

  - functions similarly to the TRUNCATE statement

- **TRUNCATE vs. DELETE**

  TRUNCATE allows us to remove all the records contained in a table

  vs.

  with DELETE, you can specify precisely what you would like to be removed

Data Manipulation Language


```
DELETE FROM sales;
```

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language


```
DELETE FROM sales;
```

```
TRUNCATE TABLE sales;
```

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language


```
DELETE FROM sales;
```

```
TRUNCATE TABLE sales;
```

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language


```
DELETE FROM sales
WHERE
     purchase_number = 1;
```

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language


```
DELETE FROM sales
WHERE
     purchase_number = 1;
```

sales

purchase_number	date_of_purchase
1	2017-10-11
2	2017-10-27

Data Manipulation Language

Data Manipulation Language (DML)

- SELECT… FROM…
- INSERT INTO… VALUES…
- UPDATE… SET… WHERE…
- DELETE FROM… WHERE…

Data Control Language (DCL)

Data Control Language

- Data Control Language (DCL)

Data Control Language

- Data Control Language (DCL)
- the GRANT and REVOKE statements

Data Control Language

- Data Control Language (DCL)
- the GRANT and REVOKE statements

allow us to manage the rights users have in a database

Data Control Language

Data Control Language

Data Control Language

Data Control Language

- The GRANT statement

Data Control Language

The GRANT statement

gives (or grants) certain permissions to users

Data Control Language

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gives (or grants) certain permissions to users

Data Control Language

The GRANT statement

gives (or grants) certain permissions to users


```
GRANT type_of_permission ON database_name.table_name TO
‘username’@’localhost’
```

Data Control Language

- **The GRANT statement**

  gives (or grants) certain permissions to users

- one can grant a *specific* type of permission, like *complete* or *partial access*


```
GRANT type_of_permission ON database_name.table_name TO
‘username’@’localhost’
```

Data Control Language

- these rights will be assigned to a person who has a *username* registered at the *local server* (*'localhost': IP 127.0.0.1*)


```
GRANT type_of_permission ON database_name.table_name TO
'username'@'localhost'
```

Data Control Language

- these rights will be assigned to a person who has a *username* registered at the *local server* (*'localhost': IP 127.0.0.1*)
- big companies and corporations don't use this type of server, and their databases lay on *external*, more powerful servers


```
GRANT type_of_permission ON database_name.table_name TO
'username'@'localhost'
```

Data Control Language

- Database administrators

Data Control Language

- **Database administrators**

  people who have *complete* rights to a database

Data Control Language

- **Database administrators**

  people who have *complete* rights to a database

  - they can grant access to users and can revoke it

Data Control Language

- **Database administrators**

  people who have *complete* rights to a database

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- **the REVOKE clause**

Data Control Language

- **Database administrators**

  people who have *complete* rights to a database

  - they can grant access to users and can revoke it

- **the REVOKE clause**

  used to revoke permissions and privileges of database users

Data Control Language

- **Database administrators**

  people who have *complete* rights to a database

  - they can grant access to users and can revoke it

- **the REVOKE clause**

  used to revoke permissions and privileges of database users

  - the exact opposite of GRANT

Data Control Language

- **the REVOKE clause**

  used to revoke permissions and privileges of database users

Data Control Language

the REVOKE clause

used to revoke permissions and privileges of database users


```
REVOKE type_of_permission ON database_name.table_name FROM
‘username’@’localhost’
```

Transaction Control Language (TCL)

Transaction Control Language

- Transaction Control Language (TCL)

Transaction Control Language

Transaction Control Language (TCL)

- not every change you make to a database is saved automatically

Transaction Control Language

- Transaction Control Language (TCL)

  - not every change you make to a database is saved automatically

- the COMMIT statement

Transaction Control Language

- **Transaction Control Language (TCL)**

  - not every change you make to a database is saved automatically

- **the COMMIT statement**

  - related to INSERT, DELETE, UPDATE

Transaction Control Language

- **Transaction Control Language (TCL)**
  - not every change you make to a database is saved automatically

- **the COMMIT statement**
  - related to INSERT, DELETE, UPDATE
  - will save the changes you've made

Transaction Control Language

- **Transaction Control Language (TCL)**

  - not every change you make to a database is saved automatically

- **the COMMIT statement**

  - related to INSERT, DELETE, UPDATE
  - will save the changes you've made
  - will let other users have access to the modified version of the database

Transaction Control Language

DB administrator

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	john.mackinley@365careers.com	0
2	Elizabeth	McFarlane	e.mcfarlane@365careers.com	2
3	Kevin	Lawrence	kevin.lawrence@365careers.com	1
4	Catherine	Winnfield	c.winnfield@365careers.com	0

Transaction Control Language

DB administrator

- Change the last name of the 4th customer from ‘Winnfield’ to ‘Johnson’

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	john.mackinley@365careers.com	0
2	Elizabeth	McFarlane	e.mcfarlane@365careers.com	2
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Transaction Control Language

DB administrator

- Change the last name of the 4th customer from ‘Winnfield’ to ‘Johnson’

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4	Catherine		c.winnfield@365careers.com	0

Transaction Control Language

DB administrator

- Change the last name of the 4th customer from ‘Winnfield’ to ‘Johnson’

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Transaction Control Language

DB administrator

Customers				
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4	Catherine	Winnfield	c.winnfield@365careers.com	0

Transaction Control Language

DB administrator


```
UPDATE customers
SET last_name = 'Johnson'
WHERE customer_id = 4;
```

Customers

customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	john.mackinley@365careers.com	0
2	Elizabeth	McFarlane	e.mcfarlane@365careers.com	2
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Transaction Control Language

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Transaction Control Language

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Transaction Control Language

DB administrator

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Problem:

users

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Transaction Control Language

DB administrator


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Transaction Control Language

DB administrator


```
UPDATE customers
SET last_name = 'Johnson'
WHERE customer_id = 4
COMMIT;
```

Customers

customer_id	first_name	last_name	email_address	number_of_complaints
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Transaction Control Language

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users

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Transaction Control Language

- the COMMIT statement

Transaction Control Language

- **the COMMIT statement**

  committed states can accrue

Transaction Control Language

- the COMMIT statement

  committed states can accrue

- the ROLLBACK clause

Transaction Control Language

- **the COMMIT statement**

  committed states can accrue

- **the ROLLBACK clause**

  the clause that will let you make a step back

Transaction Control Language

- **the COMMIT statement**

  committed states can accrue

- **the ROLLBACK clause**

  the clause that will let you make a step back

  - allows you to undo any changes you have made but don’t want to be saved permanently

Transaction Control Language

DB administrator

SQL

```
UPDATE customers
SET last_name = 'Johnson'
WHERE customer_id = 4
COMMIT;
```

Customers

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Transaction Control Language

DB administrator

SQL

```
UPDATE customers
SET last_name = 'Johnson'
WHERE customer_id = 4
COMMIT;

ROLLBACK;
```

Customers

customer_id	first_name	last_name	email_address	number_of_complaints
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Transaction Control Language

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```
UPDATE customers
SET last_name = 'Johnson'
WHERE customer_id = 4
COMMIT;

ROLLBACK;
```

Customers

customer_id	first_name	last_name	email_address	number_of_complaints
1	John	McKinley	john.mackinley@365careers.com	0
2	Elizabeth	McFarlane	e.mcfarlane@365careers.com	2
3	Kevin	Lawrence	kevin.lawrence@365careers.com	1
4	Catherine	Winnfield	c.winnfield@365careers.com	0

Transaction Control Language

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  - saves the transaction in the database

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  - the last change(s) made will not count
  - reverts to the last committed state

SQL Syntax

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

SQL Syntax

- **DDL – Data Definition Language**

  creation of data

- **DML – Data Manipulation Language**

  manipulation of data

- **DCL – Data Control Language**

  assignment and removal of permissions to use this data

- **TCL – Transaction Control Language**

  saving and restoring changes to a database