SQL Theory

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Data Definition Language (DDL)
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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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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

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);
```

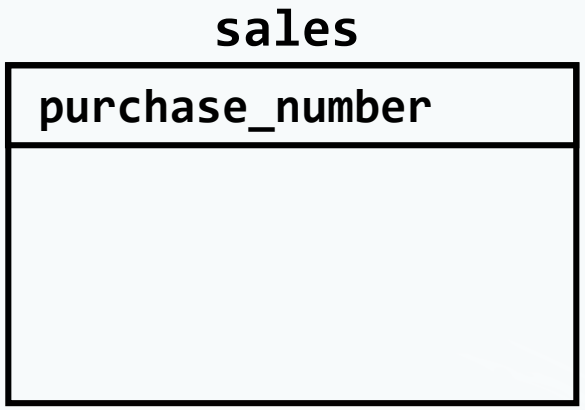
```
CREATE TABLE sales (purchase_number INT);
```

Data Definition Language

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

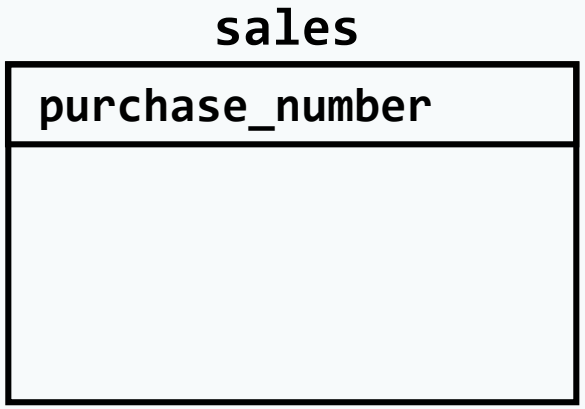
SQL

```
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

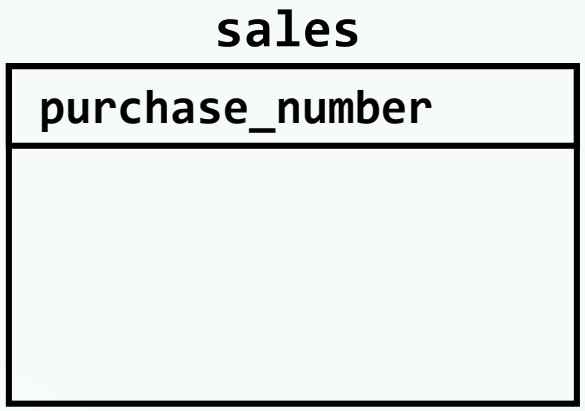
Data Definition Language

- **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

SQL

```
DROP object_type object_name;
```

```
DROP TABLE customers;
```

customers

customer_id	first_name

Data Definition Language

used for deleting a database object

SQL

```
DROP object_type object_name;
```

```
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


```
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


```
TRUNCATE object_type object_name;
```

```
TRUNCATE TABLE customers;
```

customers

customer_id	first_name

Data Definition Language


```
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

Next:

Next:

Keywords

Next:

Keywords

Data Manipulation Language


SQL Keywords
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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)

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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

SQL

```
SELECT * FROM sales;
```

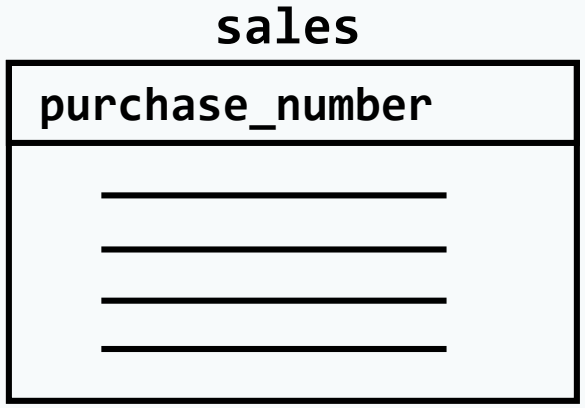
sales

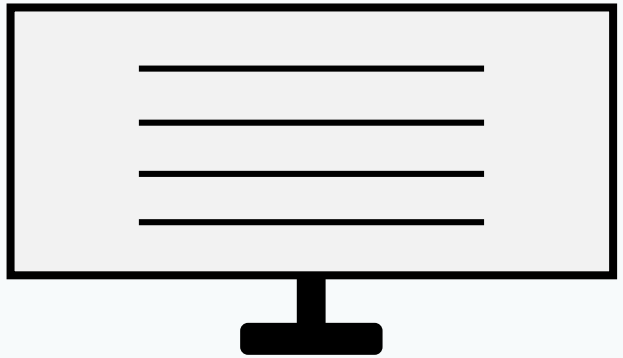
purchase_number

Data Manipulation Language

SQL

```
SELECT * FROM sales;
```





Data Manipulation Language


```
SELECT… FROM sales;
```

sales

purchase_number

Data Manipulation Language


```
SELECT… FROM sales;
```

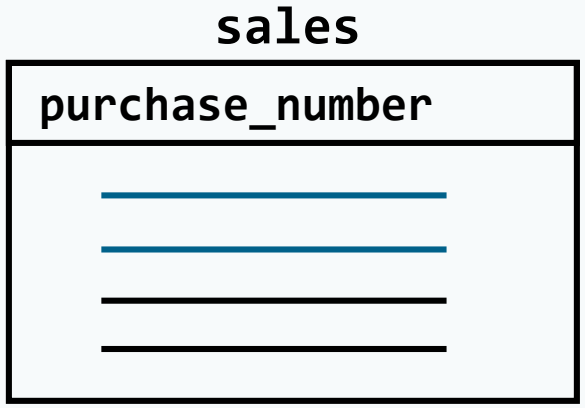
sales

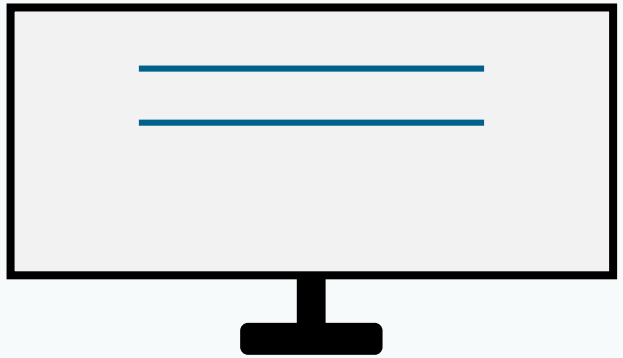
purchase_number

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

SQL

```
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…

Next:

Data Control Language (DCL)

Data Control Language (DCL)

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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

- **The GRANT statement**

  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

  - they can grant access to users and can revoke it

- **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’
```

Data Control Language

Next:

Data Control Language

Next:

Transaction Control Language (TCL)

Transaction Control Language (DCL)

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Transaction Control Language

- Transaction Control Language (DCL)

Transaction Control Language

Transaction Control Language (DCL)

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

Transaction Control Language

- Transaction Control Language (DCL)

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

- the COMMIT statement

Transaction Control Language

- **Transaction Control Language (DCL)**

  - 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 (DCL)**
  - 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 (DCL)**

  - 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
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
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3	Kevin	Lawrence	kevin.lawrence@365careers.com	1
4	Catherine		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
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4	Catherine	Johnson	c.winnfield@365careers.com	0

Transaction Control Language

DB administrator

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
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4	Catherine	Winnfield	c.winnfield@365careers.com	0

Transaction Control Language

DB administrator

SQL

```
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

DB administrator


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4	Catherine		c.winnfield@365careers.com	0

Transaction Control Language

DB administrator


```
UPDATE customers
SET last_name = 'Johnson'
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Customers

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Transaction Control Language

DB administrator

Customers				
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Problem:

users

Customers				
customer_id	first_name	last_name	email_address	number_of_complaints
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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
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3	Kevin	Lawrence	kevin.lawrence@365careers.com	1
4	Catherine	Johnson	c.winnfield@365careers.com	0

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
1	John	McKinley	john.mackinley@365careers.com	0
2	Elizabeth	McFarlane	e.mcfarlane@365careers.com	2
3	Kevin	Lawrence	kevin.lawrence@365careers.com	1
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Transaction Control Language

DB administrator

Customers				
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users

Customers				
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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

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

Transaction Control Language

- the COMMIT statement

Transaction Control Language

- **the COMMIT statement**
  - saves the transaction in the database

Transaction Control Language

the COMMIT statement

- saves the transaction in the database
- changes cannot be undone

Transaction Control Language

- the COMMIT statement
  - saves the transaction in the database
  - changes cannot be undone
- the ROLLBACK clause

Transaction Control Language

- **the COMMIT statement**
  - saves the transaction in the database
  - changes cannot be undone
- **the ROLLBACK clause**
  - allows you to take a step back

Transaction Control Language

- **the COMMIT statement**
  - saves the transaction in the database
  - changes cannot be undone
- **the ROLLBACK clause**
  - allows you to take a step back
  - the last change(s) made will not count

Transaction Control Language

the COMMIT statement

- saves the transaction in the database
- changes cannot be undone

the ROLLBACK clause

- allows you to take a step back
- the last change(s) made will not count
- reverts to the last non-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

Next:

Next:

More about Database Theory