Lecture 3

Data Manipulation Language.
PostgreSQL Data Types.
Basic SQL operators.

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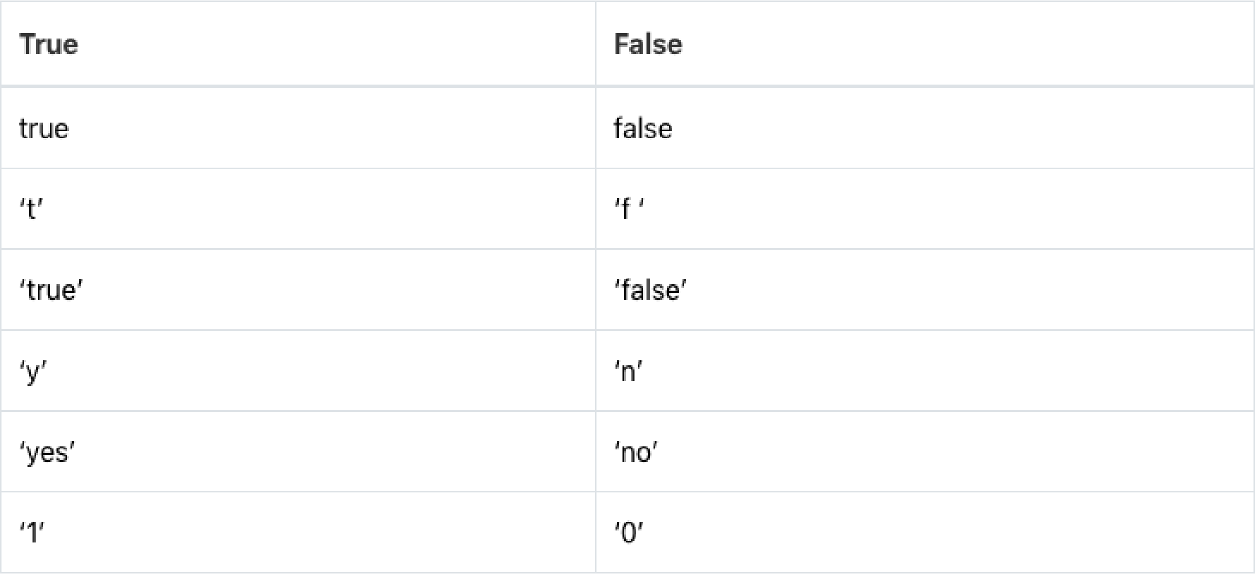
PostgreSQL Data Types

- Boolean
- Character types such as char, varchar, and text.
- Numeric types such as integer and floating-point number.
- Temporal types such as date, time, timestamp, and interval UUID for storing Universally Unique Identifiers
- Array for storing array strings, numbers, etc.
- JSON stores JSON data
- hstore stores key-value pair
- Special types such as network address and geometric data.

Boolean

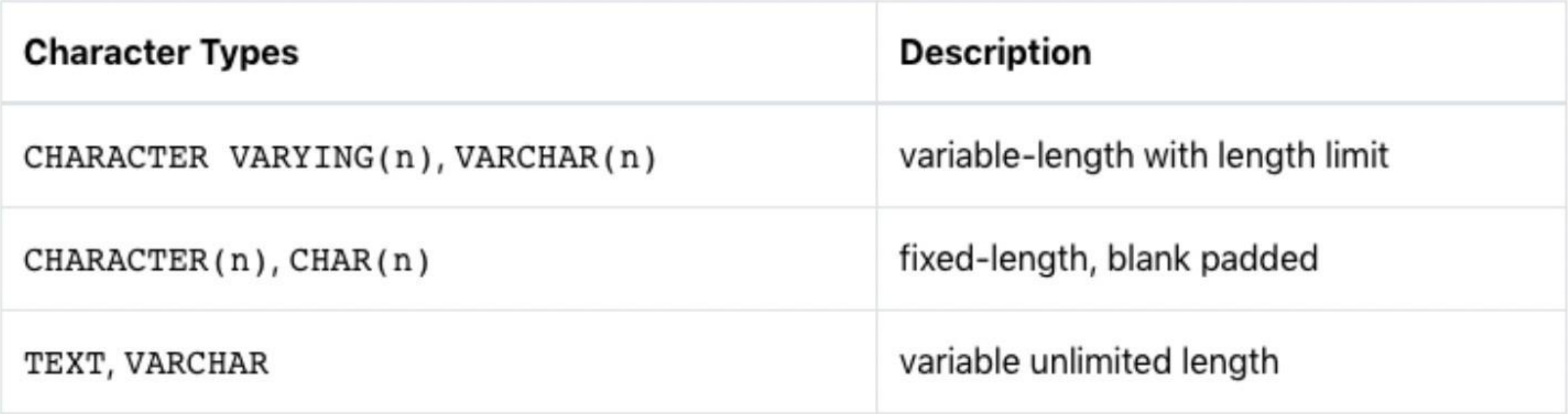
A Boolean data type can hold one of three possible values: true, false and NULL. You use boolean or bool keyword to declare a column with the Boolean data type.



True	False
true	false
‘t’	‘f ’
‘true’	‘false’
‘y’	’n’
‘yes’	’no’
‘1’	’0’

Character

The following table illustrate the character types in PostgreSQL:



Character Types	Description
`CHARACTER VARYING(n)`, `VARCHAR(n)`	variable-length with length limit
`CHARACTER(n)`, `CHAR(n)`	fixed-length, blank padded
`TEXT`, `VARCHAR`	variable unlimited length

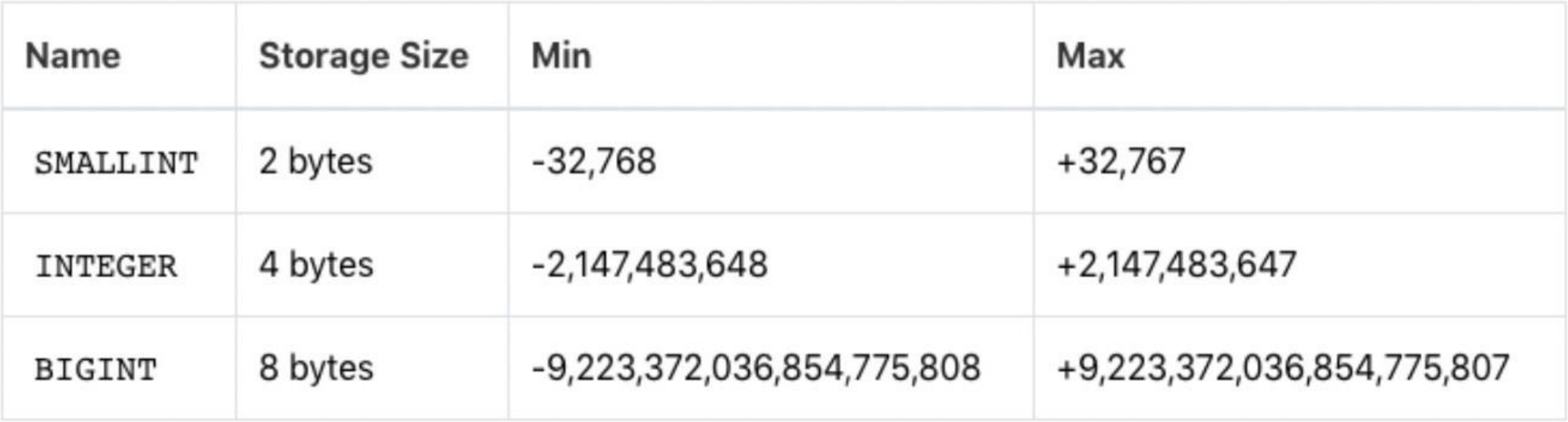
Numeric

PostgreSQL provides two distinct types of numbers:

- integers
- floating-point numbers

Integer

The following table illustrates the specification of each integer type:



Name	Storage Size	Min	Max
`SMALLINT`	2 bytes	-32,768	+32,767
`INTEGER`	4 bytes	-2,147,483,648	+2,147,483,647
`BIGINT`	8 bytes	-9,223,372,036,854,775,808	+9,223,372,036,854,775,807

Floating-point number

There are three main types of floating-point numbers:

-**float(n)** is a floating-point number with precision, at least, n, up to a maximum of 8 bytes.

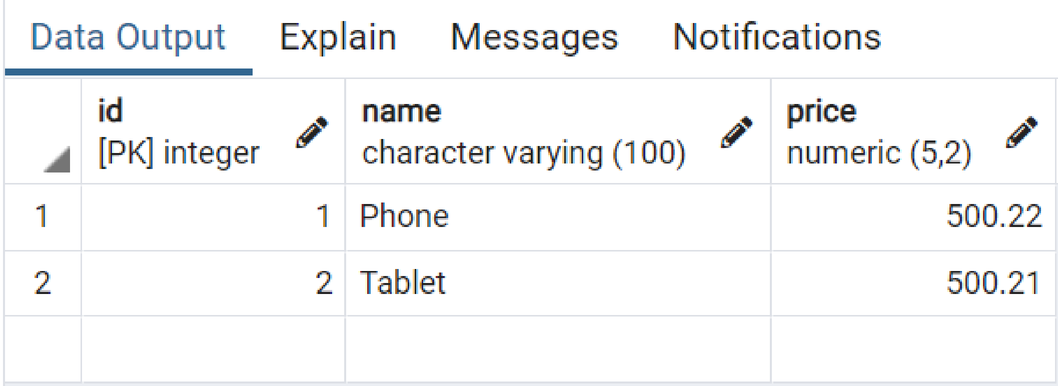
- **Real** or **float8** is a 4-byte floating-point number.

-**numeric** or **numeric(p,s)** is a real number with p digits with s number after the decimal point. The **numeric(p,s)** is the exact number.

Example of Numeric(p,s)

```
DROP TABLE IF EXISTS products;
CREATE TABLE products (
id SERIAL   PRIMARY KEY,
name VARCHAR(100) NOT NULL,
price NUMERIC(5,2)
);

INSERT INTO products (name, price)
VALUES ('Phone',500.215),
('Tablet',500.214);
```

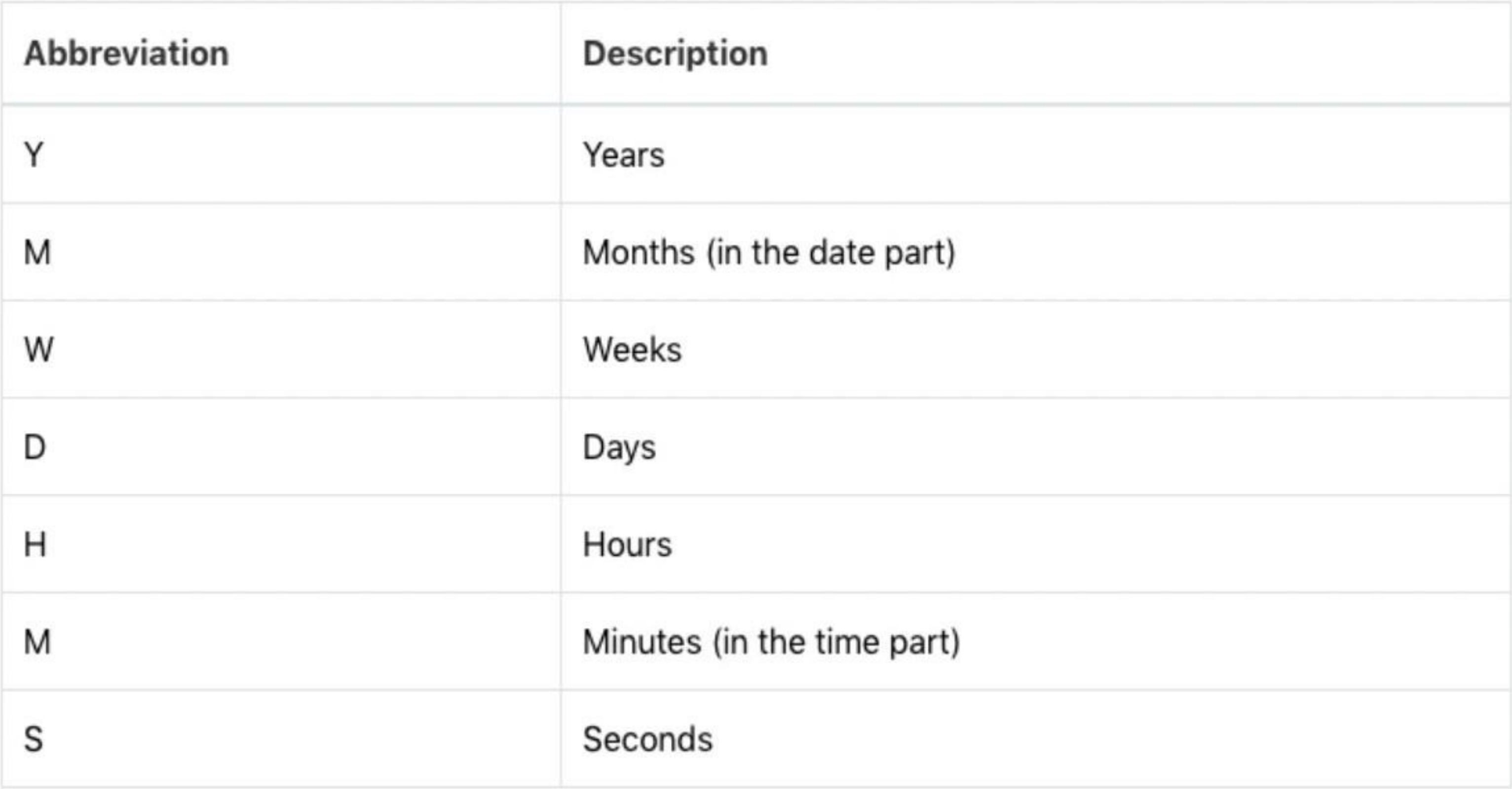


	id [PK] integer	name character varying (100)	price numeric (5,2)
1	1	Phone	500.22
2	2	Tablet	500.21

Temporal data types

- **DATE** stores the dates only.
- **TIME** stores the time of day values.
- **TIMESTAMP** stores both date and time values.
- **TIMESTAMPTZ** is a time zone-aware timestamp data type. It is the abbreviation for timestamp with the time zone.
- **INTERVAL** stores periods of time.

The following table illustrates the ISO 8601 interval unit abbreviations:



Abbreviation	Description
Y	Years
M	Months (in the date part)
W	Weeks
D	Days
H	Hours
M	Minutes (in the time part)
S	Seconds

Data Manipulation Language

A **data manipulation language (DML)** in PostgreSQL consists of SQL commands used to manage and manipulate data stored within the database tables.

The primary DML commands are **INSERT**, **UPDATE**, **DELETE**

This manipulation involves inserting data into database tables, retrieving existing data, deleting data from existing tables and modifying existing data. DML is mostly incorporated in SQL databases.

Commands for DML:

- **UPDATE**: This command modifies data of one or more records.

- **INSERT**: This command adds one or more records to a database table.

- **DELETE**: This command removes one or more records from a table according to specified conditions.

PostgreSQL INSERT

The PostgreSQL statement allows you to insert a new row into a table. The following illustrates the most basic syntax of the INSERT statement:

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

PostgreSQL INSERT Multiple Rows

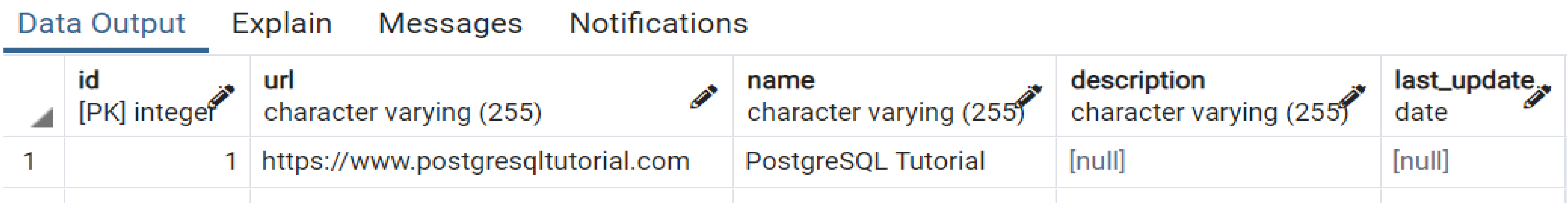
To insert multiple rows into a table using a single INSERT statement, you use the following syntax:

```
INSERT INTO table_name
(column_list) VALUES
(value_list_),
(value_list_),
...
(value_list_n);
```

PostgreSQL INSERT statement examples

```
DROP TABLE IF EXISTS links;
CREATE TABLE links (
id SERIAL   PRIMARY KEY,
url VARCHAR(255) NOT NULL,  name VARCHAR(255) NOT NULL,
description VARCHAR (255),  last_update DATE
);

INSERT INTO links (url, name)  VALUES('https://www.postgresqltutorial.com','PostgreSQL Tutorial');
```

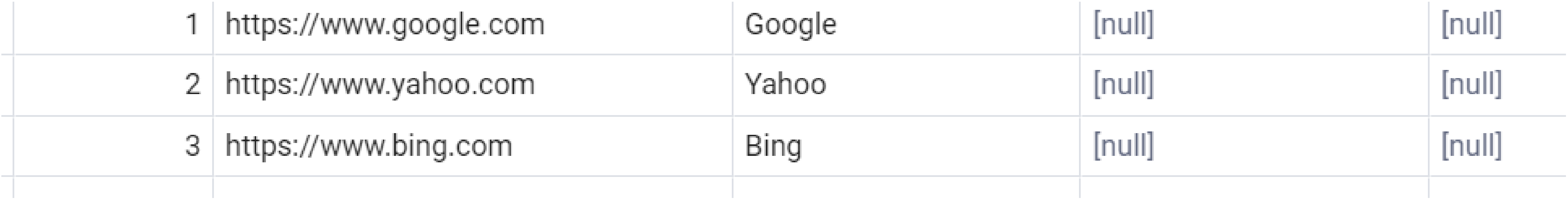


	id [PK] integer	url character varying (255)	name character varying (255)	description character varying (255)	last_update date
1	1	https://www.postgresqltutorial.com	PostgreSQL Tutorial	[null]	[null]

Inserting multiple rows and returning inserted rows

```
INSERT INTO
links (url, name)  VALUES
('https://www.google.com','Google'),
('https://www.yahoo.com','Yahoo'),
('https://www.bing.com','Bing');

select * from links
```



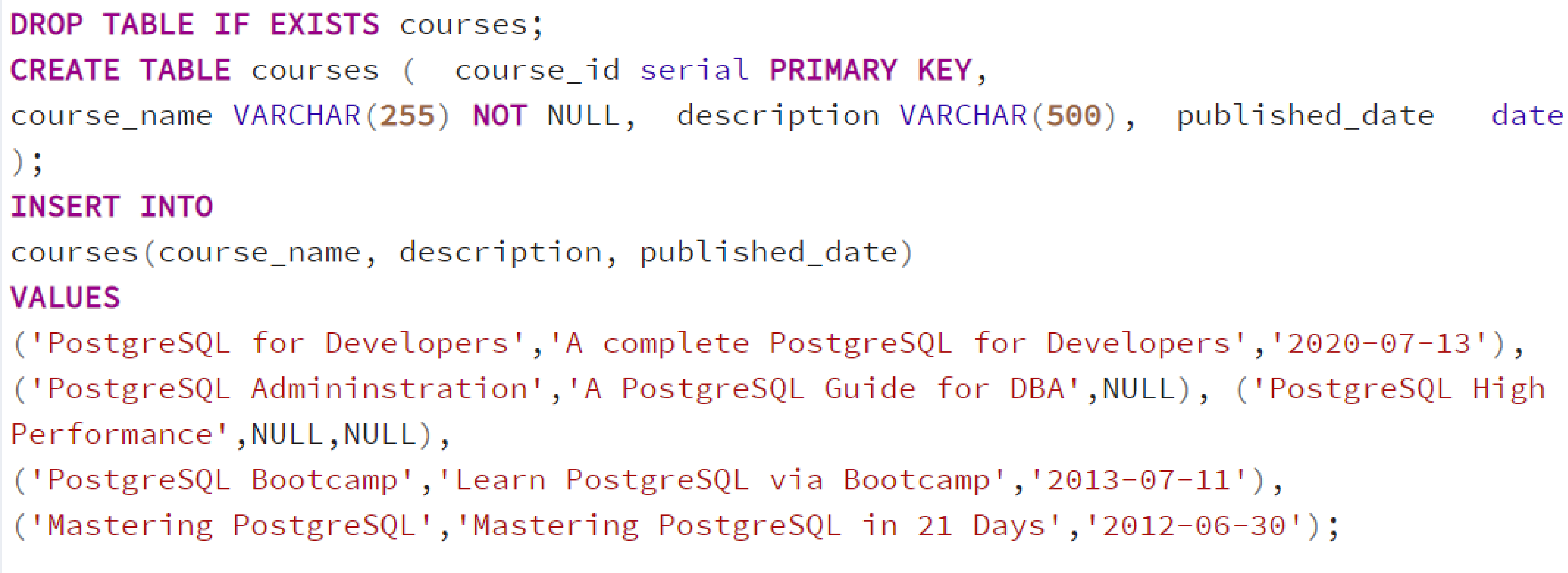
1	https://www.google.com	Google	[null]	[null]
2	https://www.yahoo.com	Yahoo	[null]	[null]
3	https://www.bing.com	Bing	[null]	[null]

PostgreSQL UPDATE

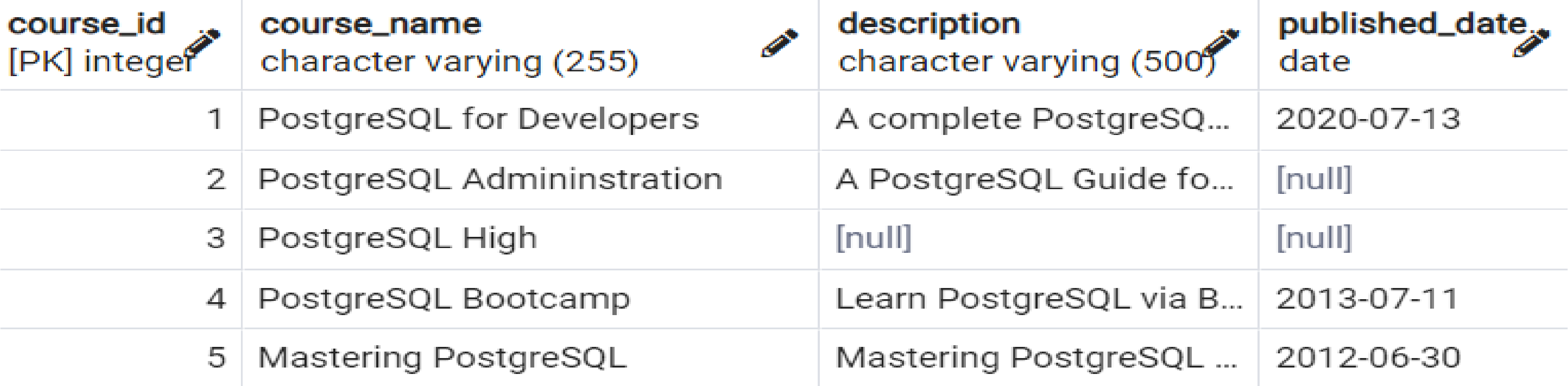
The PostgreSQL **UPDATE** statement allows you to modify data in a table.
The following illustrates the syntax of the **UPDATE** statement:

```
UPDATE table_name
SET column1 = value1,
    column2 = value2,
…
WHERE condition;
```

PostgreSQL UPDATE examples

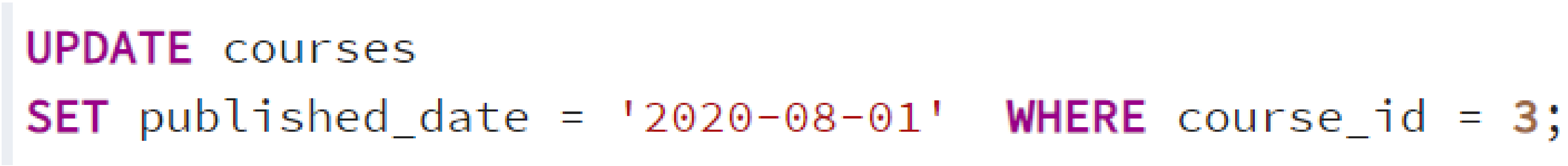


```sql
DROP TABLE IF EXISTS courses;
CREATE TABLE courses (  course_id serial PRIMARY KEY,
course_name VARCHAR(255) NOT NULL,  description VARCHAR(500),  published_date   date
);
INSERT INTO
courses(course_name, description, published_date)
VALUES
('PostgreSQL for Developers','A complete PostgreSQL for Developers','2020-07-13'),
('PostgreSQL Admininstration','A PostgreSQL Guide for DBA',NULL), ('PostgreSQL High
Performance',NULL,NULL),
('PostgreSQL Bootcamp','Learn PostgreSQL via Bootcamp','2013-07-11'),
('Mastering PostgreSQL','Mastering PostgreSQL in 21 Days','2012-06-30');
```

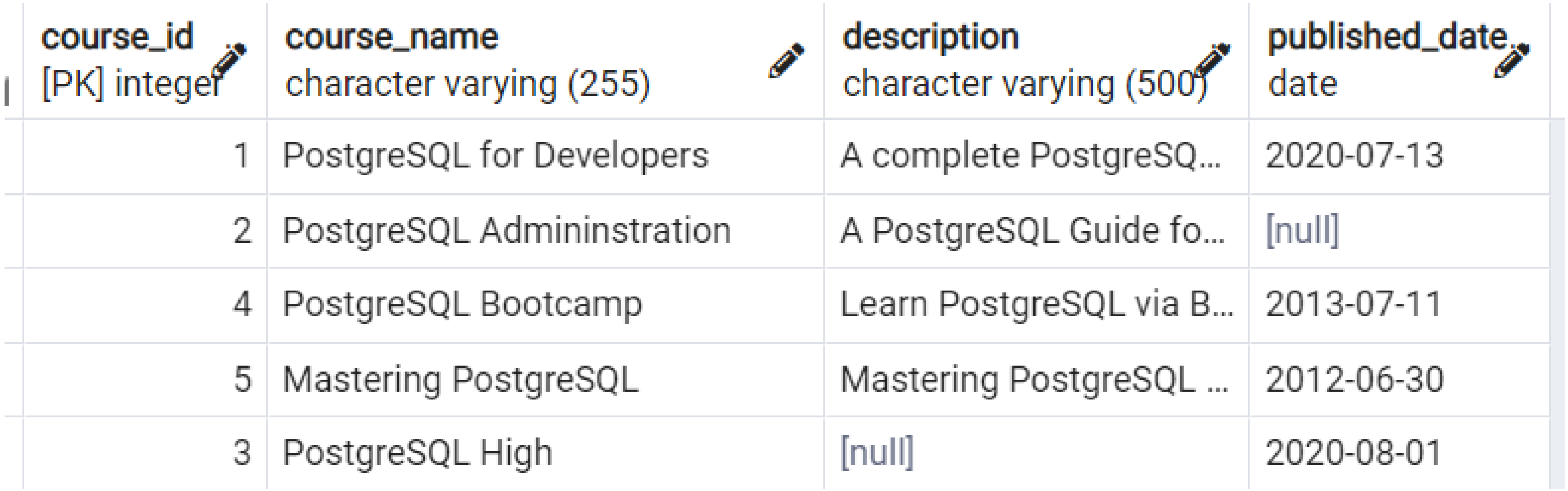


course_id [PK] integer	course_name character varying (255)	description character varying (500)	published_date date
1	PostgreSQL for Developers	A complete PostgreSQ...	2020-07-13
2	PostgreSQL Admininstration	A PostgreSQL Guide fo...	[null]
3	PostgreSQL High	[null]	[null]
4	PostgreSQL Bootcamp	Learn PostgreSQL via B...	2013-07-11
5	Mastering PostgreSQL	Mastering PostgreSQL ...	2012-06-30

PostgreSQL UPDATE – updating one row



```
UPDATE courses
SET published_date = '2020-08-01'  WHERE course_id = 3;
```



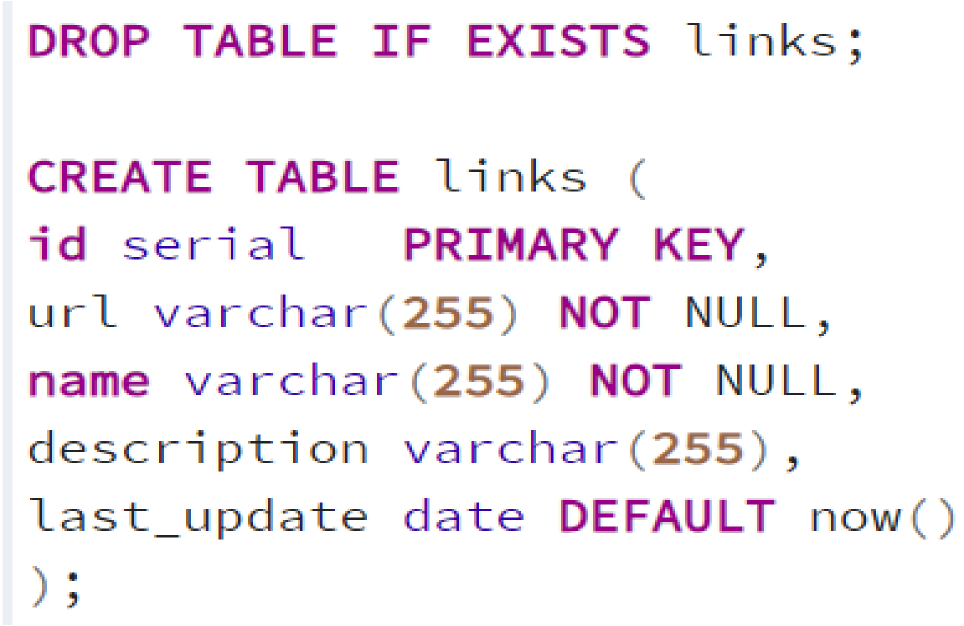
course_id [PK] integer	course_name character varying (255)	description character varying (500)	published_date date
1	PostgreSQL for Developers	A complete PostgreSQ...	2020-07-13
2	PostgreSQL Admininstration	A PostgreSQL Guide fo...	[null]
4	PostgreSQL Bootcamp	Learn PostgreSQL via B...	2013-07-11
5	Mastering PostgreSQL	Mastering PostgreSQL ...	2012-06-30
3	PostgreSQL High	[null]	2020-08-01

PostgreSQL DELETE

The PostgreSQL DELETE statement allows you to delete one or more rows from a table. The following shows basic syntax of the DELETE statement:

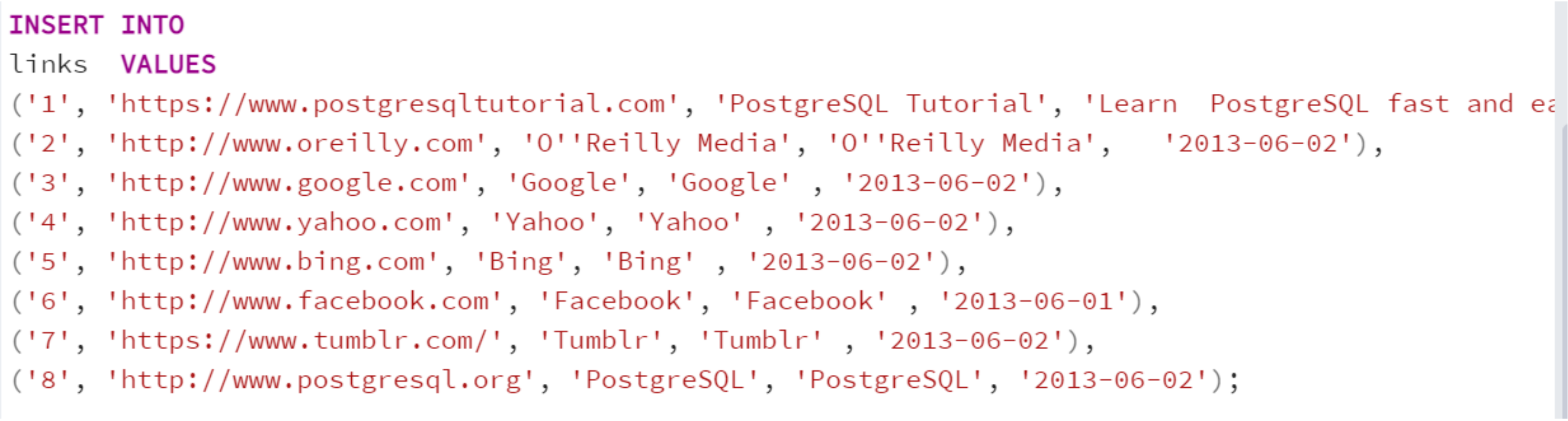
```
DELETE FROM table_name
WHERE condition;
```

PostgreSQL DELETE statement examples



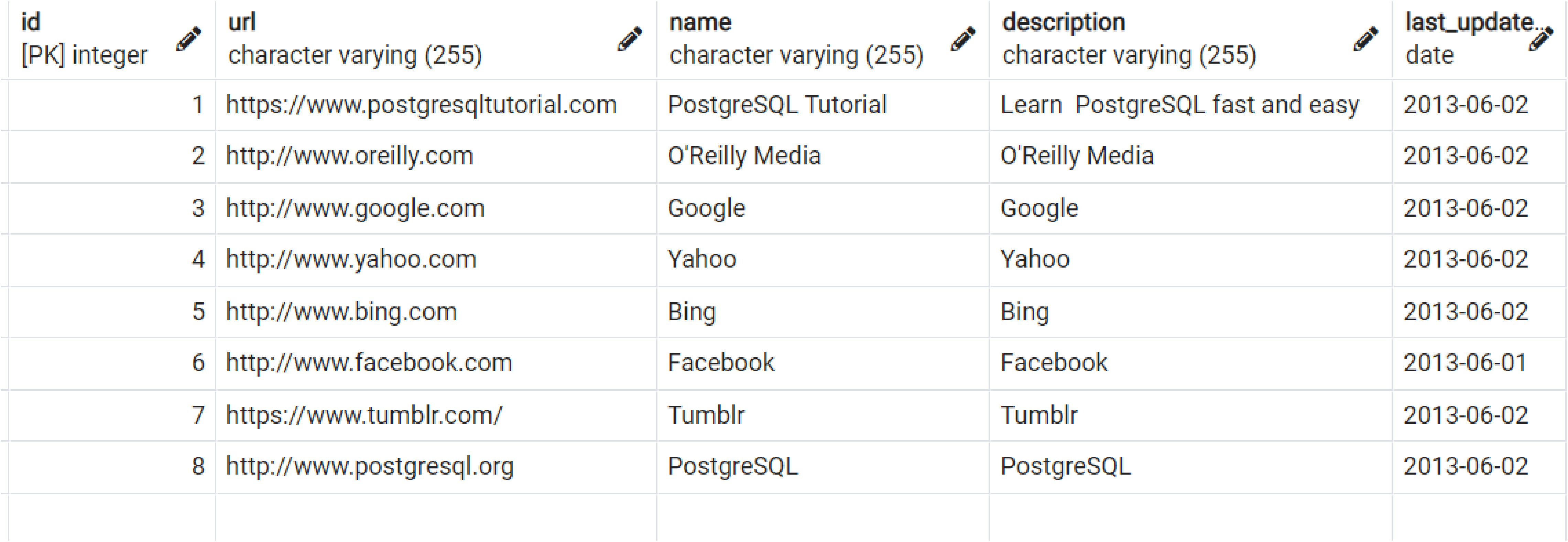
```
DROP TABLE IF EXISTS links;

CREATE TABLE links (
id serial   PRIMARY KEY,
url varchar(255) NOT NULL,
name varchar(255) NOT NULL,
description varchar(255),
last_update date DEFAULT now()
);
```



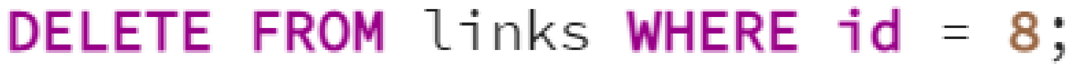
```
INSERT INTO
links  VALUES
('1', 'https://www.postgresqltutorial.com', 'PostgreSQL Tutorial', 'Learn  PostgreSQL fast and ea
('2', 'http://www.oreilly.com', 'O''Reilly Media', 'O''Reilly Media',   '2013-06-02'),
('3', 'http://www.google.com', 'Google', 'Google' , '2013-06-02'),
('4', 'http://www.yahoo.com', 'Yahoo', 'Yahoo' , '2013-06-02'),
('5', 'http://www.bing.com', 'Bing', 'Bing' , '2013-06-02'),
('6', 'http://www.facebook.com', 'Facebook', 'Facebook' , '2013-06-01'),
('7', 'https://www.tumblr.com/', 'Tumblr', 'Tumblr' , '2013-06-02'),
('8', 'http://www.postgresql.org', 'PostgreSQL', 'PostgreSQL', '2013-06-02');
```

PostgreSQL DELETE statement examples



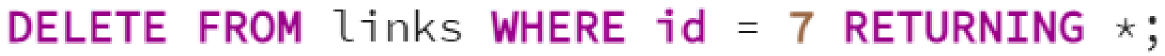
id [PK] integer	url character varying (255)	name character varying (255)	description character varying (255)	last_update date
1	https://www.postgresqltutorial.com	PostgreSQL Tutorial	Learn PostgreSQL fast and easy	2013-06-02
2	http://www.oreilly.com	O'Reilly Media	O'Reilly Media	2013-06-02
3	http://www.google.com	Google	Google	2013-06-02
4	http://www.yahoo.com	Yahoo	Yahoo	2013-06-02
5	http://www.bing.com	Bing	Bing	2013-06-02
6	http://www.facebook.com	Facebook	Facebook	2013-06-01
7	https://www.tumblr.com/	Tumblr	Tumblr	2013-06-02
8	http://www.postgresql.org	PostgreSQL	PostgreSQL	2013-06-02

Using PostgreSQL DELETE to delete one row from the table:

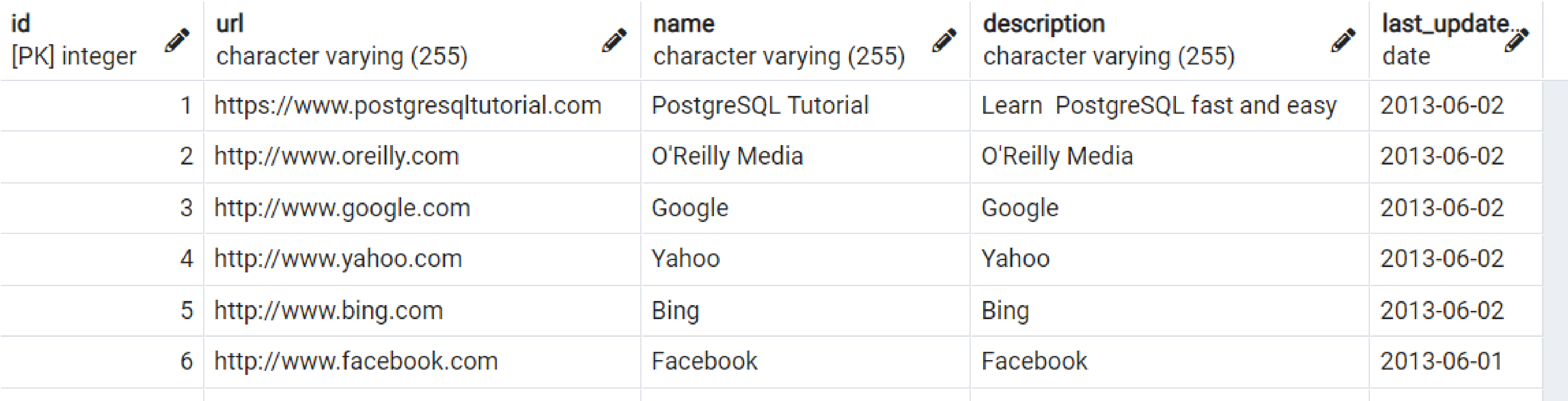


```
DELETE FROM links WHERE id = 8;
```

Using PostgreSQL DELETE to delete a row and return the deleted row:

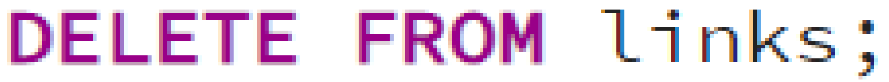


```
DELETE FROM links WHERE id = 7 RETURNING *;
```

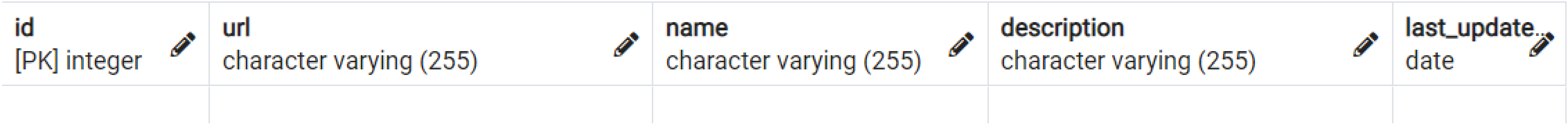


id [PK] integer	url character varying (255)	name character varying (255)	description character varying (255)	last_update... date
1	https://www.postgresqltutorial.com	PostgreSQL Tutorial	Learn PostgreSQL fast and easy	2013-06-02
2	http://www.oreilly.com	O'Reilly Media	O'Reilly Media	2013-06-02
3	http://www.google.com	Google	Google	2013-06-02
4	http://www.yahoo.com	Yahoo	Yahoo	2013-06-02
5	http://www.bing.com	Bing	Bing	2013-06-02
6	http://www.facebook.com	Facebook	Facebook	2013-06-01

Using PostgreSQL DELETE to delete all rows from the table:



```
DELETE FROM links;
```



id [PK] integer	url character varying (255)	name character varying (255)	description character varying (255)	last_update... date