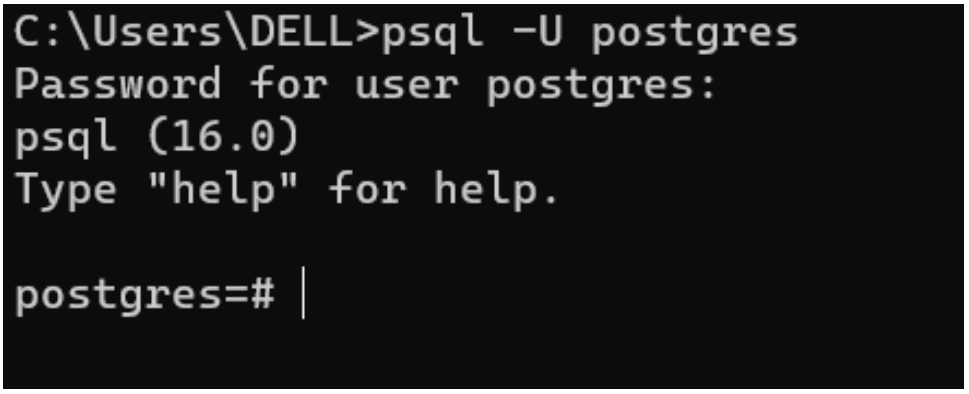
Database Homework 1

Tags

(1) The process of creating the “lego” database

- First Start up Postgresql



- create the database (change locale to English since we will be working with data in english, although maybe it doesn’t matter)

```
postgres=# CREATE DATABASE lego
postgres-# LOCALE 'en_US.UTF-8'
postgres-# TEMPLATE template0;
CREATE DATABASE
postgres=# \l
                                                                    List of databases
   Name    |  Owner   | Encoding | Locale Provider |            Collate             |             Ctype              | ICU Locale | ICU Rules |   Access privileges
-----------+----------+----------+-----------------+--------------------------------+--------------------------------+------------+-----------+-----------------------
 lego      | postgres | UTF8     | libc            | en_US.UTF-8                    | en_US.UTF-8                    |            |           |
 postgres  | postgres | UTF8     | libc            | Chinese (Traditional)_Taiwan.950 | Chinese (Traditional)_Taiwan.950 |            |           |
 template0 | postgres | UTF8     | libc            | Chinese (Traditional)_Taiwan.950 | Chinese (Traditional)_Taiwan.950 |            |           | =c/postgres          +
           |          |          |                 |                                |                                |            |           | postgres=CTc/postgres
 template1 | postgres | UTF8     | libc            | Chinese (Traditional)_Taiwan.950 | Chinese (Traditional)_Taiwan.950 |            |           | =c/postgres          +
           |          |          |                 |                                |                                |            |           | postgres=CTc/postgres
 test      | postgres | UTF8     | libc            | en_US.UTF-8                    | en_US.UTF-8                    |            |           |
(5 rows)
```

(2) The process of importing eight required .csv files into lego database

- create tables for each csv

```
lego=# \i create_tables.sql
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
CREATE TABLE
```

```
CREATE TABLE colors(
    id   int,
    name VARCHAR(30),
    rgb  VARCHAR(10),
    is_trans CHAR(1),
    PRIMARY KEY(id)
);

CREATE TABLE part_categories(
    id SERIAL,
    name VARCHAR(100),
    PRIMARY KEY(id)
);

CREATE TABLE themes(
    id SERIAL,
    name VARCHAR(100),
    parent_id int,
    PRIMARY KEY(id)
);

CREATE TABLE sets(
    set_num VARCHAR(30),
    name VARCHAR(100),
    year int,
    theme_id int,
    num_parts int,
    PRIMARY KEY(set_num)
    FOREIGN KEY(theme_id) REFERENCES themes
);


CREATE TABLE inventories(
    id  int,
    version  int,
    set_num  VARCHAR(30),
    PRIMARY KEY(id),
    FOREIGN KEY(set_num) REFERENCES sets(set_num)
);

CREATE TABLE parts(
```

```
    part_num VARCHAR(30),
    name VARCHAR(300),
    part_cat_id int,
    PRIMARY KEY(part_num),
    FOREIGN KEY(part_cat_id) REFERENCES part_categories(id)
);

CREATE TABLE inventory_parts(
    inventory_id int,
    part_num VARCHAR(30),
    color_id int,
    quantity int,
    is_spare CHAR(1),
    -- PRIMARY KEY(inventory_id, part_num, color_id),
    FOREIGN KEY(inventory_id) REFERENCES inventories(id),
    -- FOREIGN KEY(part_num) REFERENCES parts(part_num),
    FOREIGN KEY(color_id) REFERENCES colors(id)
);

CREATE TABLE inventory_sets(
    inventory_id  int,
    set_num VARCHAR(30),
    quantity int,
    PRIMARY KEY(inventory_id, set_num),
    FOREIGN KEY(inventory_id) REFERENCES inventories(id),
    FOREIGN KEY(set_num) REFERENCES sets(set_num)
);
```

Chose datatypes for each attribute of each relation by going through the .csv file, making sure all data of the dataset can fit into these tables. For example, `parts(name)` is of type `VARCHAR(300)` because some of its entries exceed even 200 characters.

Next is to choose primary keys. For most tables it's quite simple to choose, however for *inventory_parts* there the only set of attributes that uniquely identifies all entries is choosing all attributes, so I chose to omit it initially.

For foreign keys I found that the schema diagram provided isn't completely aligned with the dataset, the diagram shows `inventory_parts(part_num)` references `parts(part_num)`, however value 48002 exists only in *inventory_parts*, and is absent in *parts.*

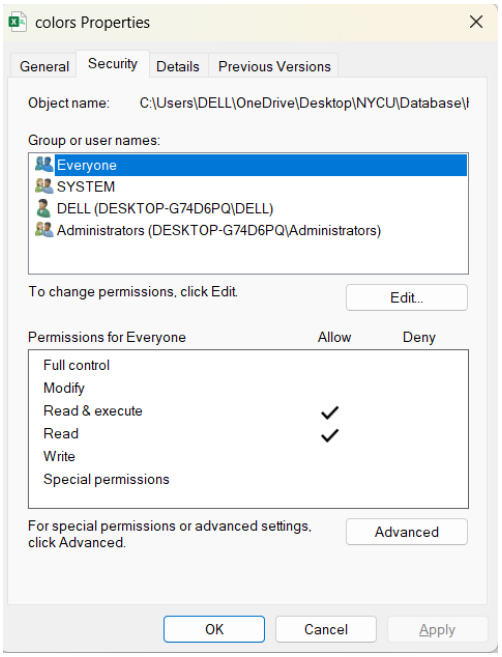
- COPY data from .csv files to tables

```
lego=# \i import.sql
COPY 135
COPY 11673
COPY 614
COPY 57
COPY 11681
COPY 25993
COPY 580251
COPY 2846
```

```
\encoding UTF-8

COPY colors(id, name, rgb, is_trans)
FROM 'C:\Users\DELL\OneDrive\Desktop\NYCU\Database\HW1\csvs\colors.csv'
DELIMITER ','
CSV HEADER;
```

Similar syntax is used for each .csv file, as shown in the example code above.

A issue I ran into is *permission denied*, solved it by going into the properties of each .csv file and enable its for everyone to read. as shown in the picture on the right.



Another Issue I encountered is encoding. It keeps showing that certain character sequences are in BIG5 encoding, even though they all seem to be in UTF-8 when inspected with Notepad. Solved it by adding the command `\encoding UTF-8` in the beginning of import.sql.

(3) extract the name of the set and name of the theme of all the LEGO sets published in 2017

```
\encoding UTF-8

\o ./results/query_result_4a.txt

SELECT
    sets.name as set_name,
    themes.name as theme_name

FROM
    sets,
    themes
WHERE
    year = 2017 and theme_id = id;
```

```
                                  set_name                                  |        theme_name
----------------------------------------------------------------------------+--------------------------
 Assembly Square                                                           | Modular Buildings
 Carousel                                                                  | Creator
 Creative Builder Box                                                      | Classic
 Creative Box                                                              | Classic
 Blue Creative Box                                                         | Classic
 Red Creative Box                                                          | Classic
 Green Creative Box                                                        | Classic
 Orange Creative Box                                                       | Classic
 Demolition Site                                                           | Juniors
```

```
 Vulture Droid foil pack                                                   | Star Wars Episode 3
 A-Wing                                                                    | Star Wars Rebels
 Wishing Well                                                              | Friends
(296 rows)
```

partial query output for 4a

full query output: Database-HW1/results/query_result_4a.txt at master · Kent-mak/Database-HW1 (github.com)

(4) extract the total number of LEGO sets in each year from 1950 to 2017, in descending order of total number of LEGO sets

```
\encoding UTF-8

\o ./results/query_result_4b.txt
```

```
SELECT
    year,
    count(year) as num_of_sets
FROM
    sets
WHERE
    year >= 1950 and year <= 2017
GROUP BY year
ORDER BY num_of_sets DESC;
```

```
year | num_of_sets
------+-------------
 2014 |         713
 2015 |         665
 2012 |         615
 2016 |         596
 2013 |         593
 2011 |         503
 2002 |         447
```

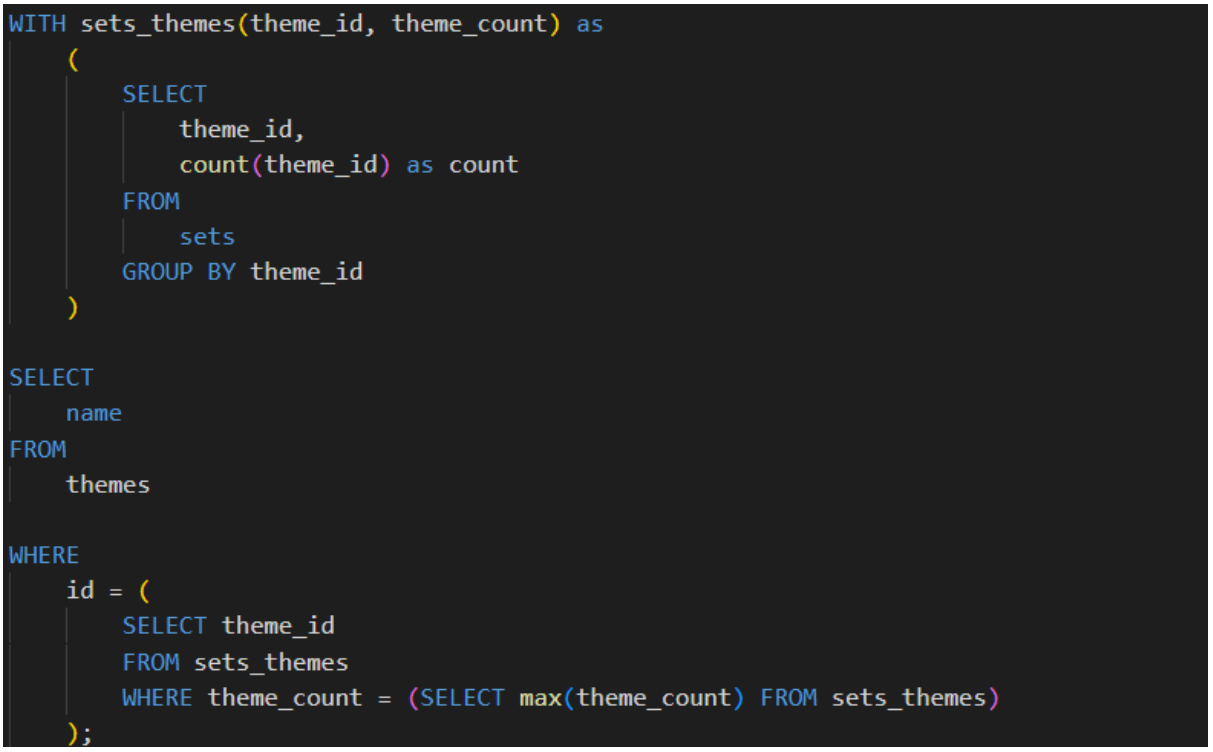


```
 1959 |           4
 1953 |           4
 1960 |           3
(66 rows)
```

partial query output for 4b

full query output: Database-HW1/results/query_result_4b.txt at master · Kent-mak/Database-HW1 (github.com)

(5) extract the name of the most popular theme, defined by the number of sets in the themes.



```sql
WITH sets_themes(theme_id, theme_count) as
    (
        SELECT
            theme_id,
            count(theme_id) as count
        FROM
            sets
        GROUP BY theme_id
    )

SELECT
    name
FROM
    themes

WHERE
    id = (
        SELECT theme_id
        FROM sets_themes
        WHERE theme_count = (SELECT max(theme_count) FROM sets_themes)
    );
```

SQL statement

```
\encoding UTF-8

\o ./results/query_result_4c.txt

WITH sets_themes(theme_id, theme_count) AS
    (
        SELECT
            theme_id,
            count(theme_id) AS count
        FROM
            sets
        GROUP BY theme_id
    )

SELECT
    name
FROM
    themes

WHERE
    id = (
        SELECT theme_id
        FROM sets_themes
        WHERE theme_count = (SELECT max(theme_count) FROM sets_themes)
    );
```

```
 name
------
 Gear
(1 row)
```

query output for 4c

(6) extract the average number of parts in a set for each theme, with the name of the theme and the average number of parts per set. In ascending order of average number of parts in a set

```
\encoding UTF-8

\o ./results/query_result_4d.txt

WITH avg_num_parts_of_theme(id, avg_num_parts) AS
    (
        SELECT
            theme_id,
            avg(num_parts) as avg_num_parts
        FROM
            sets
        GROUP BY
            theme_id
    )


SELECT
    name,
    avg_num_parts
FROM
    themes,
    avg_num_parts_of_theme
WHERE
    themes.id = avg_num_parts_of_theme.id
ORDER BY avg_num_parts ASC;
```

```
            name             |      avg_num_parts
-----------------------------+-------------------------
Wooden Box Set               | -1.0000000000000000000
Mindstorms                   |  0.0000000000000000000
Train                        |  0.0000000000000000000
Samsonite                    |  0.0000000000000000000
Key Chain                    |  0.18181818181818181818
```

```
Ultimate Collector Series      |   2130.0000000000000000
Star Wars Episode 4/5/6        |   2199.7058823529411765
Modular Buildings              |   2350.5833333333333333
Disney                         |   4060.0000000000000000
(575 rows)
```

partial query output for 4d

full query output: Database-HW1/results/query_result_4d.txt at master · Kent-mak/Database-HW1 (github.com)

(7) find out the name of the colors that are most used in the unique LEGO parts, and list the top 10.

```
\encoding UTF-8

\o ./results/query_result_4e.txt

WITH unique_parts(part_num, color_id) AS
    (
        SELECT DISTINCT
            part_num,
            color_id
        FROM
            inventory_parts
    )

SELECT
    name
FROM
    (
        SELECT
            name,
            count(color_id) as count
        FROM
            colors,
            unique_parts
        WHERE
            id = color_id
        GROUP BY name
        ORDER BY count DESC
    )
LIMIT 10;
```

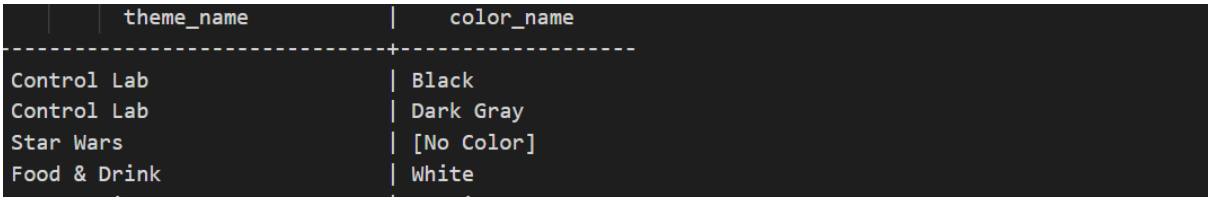
```
       name
-------------------
 White
 Black
 Yellow
 Red
 [No Color]
 Blue
 Light Bluish Gray
 Dark Bluish Gray
 Light Gray
 Tan
(10 rows)
```

query output for 4e

(8) find out the name of the colors that are most used in the LEGO parts, for each theme, and list the top 1 for each theme (please provide the name of the theme, too).

```
\encoding UTF-8

\o ./results/query_result_4f.txt

WITH color_in_theme(theme_id, theme_name, color_name, quantity) AS
    (
        SELECT
            theme_id,
            themes.name as theme_name,
            colors.name as color_name,
            sum(quantity) as quantity
        FROM
            inventory_parts,
            inventories,
            sets,
            themes,
            colors

        WHERE
            inventory_id = inventories.id
            and inventories.set_num = sets.set_num
            and theme_id = themes.id
            and colors.id = color_id

        GROUP BY
            theme_id,
            theme_name,
            color_name
```

```
        ORDER BY theme_id ASC
    ),
    theme_max_quantity(theme_id, theme_name, max_quantity) AS
    (
        SELECT
            theme_id,
            theme_name,
            max(quantity) as max_quantity
        FROM
            color_in_theme
        GROUP BY
            theme_id,
            theme_name
    )

SELECT
    color_in_theme.theme_name as theme_name,
    color_name
FROM
    color_in_theme,
    theme_max_quantity
WHERE
    quantity = max_quantity
    and color_in_theme.theme_id = theme_max_quantity.theme_id
```



```
    theme_name           |    color_name
-------------------------------+------------------
Control Lab                   | Black
Control Lab                   | Dark Gray
Star Wars                     | [No Color]
Food & Drink                  | White
```

```
 Star Wars Episode 4/5/6      | Light Bluish Gray
 Basic Set                    | Red
 Construction                 | Black
 Technic                      | Black
(568 rows)
```

full query output: Database-HW1/results/query_result_4f.txt at master · Kent-mak/Database-HW1 (github.com)