L1 E2 - 1 - Slicing and Dicing

February 6, 2023

1 Exercise 02 - OLAP Cubes - Slicing and Dicing

All the databases table in this demo are based on public database samples and transformations - Sakila is a sample database created by MySql Link - The postgresql version of it is called Pagila Link - The facts and dimension tables design is based on O'Reilly's public dimensional modelling tutorial schema Link

Start by creating and connecting to the database by running the cells below.

```
In [6]: !PGPASSWORD=student createdb -h 127.0.0.1 -U student pagila_star
        !PGPASSWORD=student psql -q -h 127.0.0.1 -U student -d pagila_star -f Data/pagila-star.s
createdb: database creation failed: ERROR: database "pagila_star" already exists
 set_config
(1 row)
psql:Data/pagila-star.sql:41: ERROR:
                                      type "mpaa_rating" already exists
psql:Data/pagila-star.sql:51: ERROR:
                                      type "year" already exists
psql:Data/pagila-star.sql:68: ERROR:
                                      function "_group_concat" already exists with same argument
psql:Data/pagila-star.sql:85: ERROR:
                                      function "film_in_stock" already exists with same argument
psql:Data/pagila-star.sql:102: ERROR:
                                       function "film_not_in_stock" already exists with same arg
                                       function "get_customer_balance" already exists with same
psql:Data/pagila-star.sql:147: ERROR:
psql:Data/pagila-star.sql:169: ERROR:
                                       function "inventory_held_by_customer" already exists with
                                       function "inventory_in_stock" already exists with same ar
psql:Data/pagila-star.sql:206: ERROR:
                                       function "last_day" already exists with same argument type
psql:Data/pagila-star.sql:224: ERROR:
psql:Data/pagila-star.sql:239: ERROR:
                                       function "last_updated" already exists with same argument
                                       relation "customer" already exists
psql:Data/pagila-star.sql:263: ERROR:
psql:Data/pagila-star.sql:327: ERROR:
                                       function "rewards_report" already exists with same argume
psql:Data/pagila-star.sql:339: ERROR:
                                       function "group_concat" already exists with same argument
psql:Data/pagila-star.sql:353: ERROR:
                                       relation "actor_actor_id_seq" already exists
psql:Data/pagila-star.sql:367: ERROR:
                                       relation "actor" already exists
psql:Data/pagila-star.sql:381: ERROR:
                                       relation "category_category_id_seq" already exists
psql:Data/pagila-star.sql:394: ERROR:
                                       relation "category" already exists
psql:Data/pagila-star.sql:408: ERROR:
                                       relation "film_film_id_seq" already exists
psql:Data/pagila-star.sql:432: ERROR:
                                       relation "film" already exists
psql:Data/pagila-star.sql:445: ERROR:
                                       relation "film_actor" already exists
```

```
psql:Data/pagila-star.sql:458: ERROR:
                                       relation "film_category" already exists
psql:Data/pagila-star.sql:481: ERROR:
                                       relation "actor_info" already exists
psql:Data/pagila-star.sql:495: ERROR:
                                       relation "address_address_id_seq" already exists
psql:Data/pagila-star.sql:513: ERROR:
                                       relation "address" already exists
psql:Data/pagila-star.sql:527: ERROR:
                                       relation "city_city_id_seq" already exists
psql:Data/pagila-star.sql:541: ERROR:
                                       relation "city" already exists
psql:Data/pagila-star.sql:555: ERROR:
                                       relation "country_country_id_seq" already exists
psql:Data/pagila-star.sql:568: ERROR:
                                       relation "country" already exists
psql:Data/pagila-star.sql:582: ERROR:
                                       relation "customer_customer_id_seq" already exists
                                       relation "customer_customer_id_seq1" already exists
psql:Data/pagila-star.sql:596: ERROR:
psql:Data/pagila-star.sql:628: ERROR:
                                       relation "customer_list" already exists
psql:Data/pagila-star.sql:654: ERROR:
                                       relation "dimcustomer" already exists
                                       relation "dimcustomer_customer_key_seq" already exists
psql:Data/pagila-star.sql:668: ERROR:
psql:Data/pagila-star.sql:693: ERROR:
                                       relation "dimdate" already exists
                                       relation "dimmovie" already exists
psql:Data/pagila-star.sql:714: ERROR:
psql:Data/pagila-star.sql:728: ERROR:
                                       relation "dimmovie_movie_key_seq" already exists
psql:Data/pagila-star.sql:757: ERROR:
                                       relation "dimstore" already exists
psql:Data/pagila-star.sql:771: ERROR:
                                       relation "dimstore_store_key_seq" already exists
psql:Data/pagila-star.sql:794: ERROR:
                                       relation "factsales" already exists
psql:Data/pagila-star.sql:808: ERROR:
                                       relation "factsales_sales_key_seq" already exists
psql:Data/pagila-star.sql:838: ERROR:
                                       relation "film_list" already exists
psql:Data/pagila-star.sql:852: ERROR:
                                       relation "inventory_inventory_id_seq" already exists
psql:Data/pagila-star.sql:866: ERROR:
                                       relation "inventory" already exists
psql:Data/pagila-star.sql:880: ERROR:
                                       relation "language_language_id_seq" already exists
psql:Data/pagila-star.sql:893: ERROR:
                                       relation "language" already exists
psql:Data/pagila-star.sql:916: ERROR:
                                       relation "nicer_but_slower_film_list" already exists
                                       relation "payment_payment_id_seq" already exists
psql:Data/pagila-star.sql:930: ERROR:
                                       relation "payment" already exists
psql:Data/pagila-star.sql:946: ERROR:
psql:Data/pagila-star.sql:960: ERROR:
                                       relation "rental_rental_id_seq" already exists
psql:Data/pagila-star.sql:977: ERROR:
                                       relation "rental" already exists
psql:Data/pagila-star.sql:996: ERROR:
                                       relation "sales_by_film_category" already exists
psql:Data/pagila-star.sql:1010: ERROR:
                                        relation "staff_staff_id_seq" already exists
psql:Data/pagila-star.sql:1031: ERROR:
                                        relation "staff" already exists
psql:Data/pagila-star.sql:1045: ERROR:
                                        relation "store_store_id_seq" already exists
psql:Data/pagila-star.sql:1059: ERROR:
                                        relation "store" already exists
                                        relation "sales_by_store" already exists
psql:Data/pagila-star.sql:1081: ERROR:
                                        relation "staff_list" already exists
psql:Data/pagila-star.sql:1102: ERROR:
psql:Data/pagila-star.sql:1347: ERROR:
                                        duplicate key value violates unique constraint "actor_pk
DETAIL: Key (actor_id)=(1) already exists.
CONTEXT: COPY actor, line 1
 setval
    200
(1 row)
psql:Data/pagila-star.sql:1965: ERROR: duplicate key value violates unique constraint "address_
```

DETAIL: Key (address_id)=(1) already exists.

CONTEXT: COPY address, line 1

```
setval
   605
(1 row)
psql:Data/pagila-star.sql:1996: ERROR: duplicate key value violates unique constraint "category
DETAIL: Key (category_id)=(1) already exists.
CONTEXT: COPY category, line 1
setval
    16
(1 row)
psql:Data/pagila-star.sql:2611: ERROR: duplicate key value violates unique constraint "city_pke
DETAIL: Key (city_id)=(1) already exists.
CONTEXT: COPY city, line 1
setval
_____
   600
(1 row)
psql:Data/pagila-star.sql:2735: ERROR: duplicate key value violates unique constraint "country_
DETAIL: Key (country_id)=(1) already exists.
CONTEXT: COPY country, line 1
setval
_____
   109
(1 row)
psql:Data/pagila-star.sql:3349: ERROR: duplicate key value violates unique constraint "customer
DETAIL: Key (customer_id)=(1) already exists.
CONTEXT: COPY customer, line 1
setval
_____
   599
(1 row)
setval
_____
     1
(1 row)
psql:Data/pagila-star.sql:3970: ERROR: duplicate key value violates unique constraint "dimcusto
DETAIL: Key (customer_key)=(1) already exists.
CONTEXT: COPY dimcustomer, line 1
setval
     1
```

```
(1 row)
psql:Data/pagila-star.sql:4025: ERROR: duplicate key value violates unique constraint "dimdate_
DETAIL: Key (date_key)=(20170216) already exists.
CONTEXT: COPY dimdate, line 1
psql:Data/pagila-star.sql:5033: ERROR: duplicate key value violates unique constraint "dimmovie
DETAIL: Key (movie_key)=(1) already exists.
CONTEXT: COPY dimmovie, line 1
setval
_____
      1
(1 row)
psql:Data/pagila-star.sql:5050: ERROR: duplicate key value violates unique constraint "dimstore
DETAIL: Key (store_key)=(1) already exists.
CONTEXT: COPY dimstore, line 1
setval
_____
     1
(1 row)
psql:Data/pagila-star.sql:21114: ERROR: duplicate key value violates unique constraint "factsal
DETAIL: Key (sales_key)=(1) already exists.
CONTEXT: COPY factsales, line 1
setval
 16049
(1 row)
psql:Data/pagila-star.sql:22129: ERROR: duplicate key value violates unique constraint "film_pk
DETAIL: Key (film_id)=(1) already exists.
CONTEXT: COPY film, line 1: "1
                                      ACADEMY DINOSAUR
                                                              A Epic Drama of a Feminist And a
psql:Data/pagila-star.sql:27599: ERROR: duplicate key value violates unique constraint "film_ac
DETAIL: Key (actor_id, film_id)=(1, 1) already exists.
CONTEXT: COPY film_actor, line 1
psql:Data/pagila-star.sql:28607: ERROR: duplicate key value violates unique constraint "film_ca
DETAIL: Key (film_id, category_id)=(1, 6) already exists.
CONTEXT: COPY film_category, line 1
setval
_____
  1000
(1 row)
psql:Data/pagila-star.sql:33203: ERROR: duplicate key value violates unique constraint "invento
DETAIL: Key (inventory_id)=(1) already exists.
CONTEXT: COPY inventory, line 1
setval
_____
```

```
4581
(1 row)
psql:Data/pagila-star.sql:33224: ERROR: duplicate key value violates unique constraint "language
DETAIL: Key (language_id)=(1) already exists.
CONTEXT: COPY language, line 1
setval
(1 row)
setval
  32098
(1 row)
psql:Data/pagila-star.sql:81396: ERROR: duplicate key value violates unique constraint "rental_
DETAIL: Key (rental_id)=(2) already exists.
CONTEXT: COPY rental, line 1
setval
_____
  16049
(1 row)
psql:Data/pagila-star.sql:81413: ERROR: duplicate key value violates unique constraint "staff_r
DETAIL: Key (staff_id)=(1) already exists.
CONTEXT: COPY staff, line 1
setval
_____
(1 row)
psql:Data/pagila-star.sql:81430: ERROR: duplicate key value violates unique constraint "store_r
DETAIL: Key (store_id)=(1) already exists.
CONTEXT: COPY store, line 1
 setval
(1 row)
psql:Data/pagila-star.sql:81445: ERROR:
                                         multiple primary keys for table "actor" are not allowed
                                         multiple primary keys for table "address" are not allow
psql:Data/pagila-star.sql:81453: ERROR:
psql:Data/pagila-star.sql:81461: ERROR:
                                         multiple primary keys for table "category" are not allo
                                         multiple primary keys for table "city" are not allowed
psql:Data/pagila-star.sql:81469: ERROR:
psql:Data/pagila-star.sql:81477: ERROR:
                                         multiple primary keys for table "country" are not allow
psql:Data/pagila-star.sql:81485: ERROR:
                                         multiple primary keys for table "customer" are not allo
                                         multiple primary keys for table "dimcustomer" are not a
psql:Data/pagila-star.sql:81493: ERROR:
```

multiple primary keys for table "dimdate" are not allow

psql:Data/pagila-star.sql:81501: ERROR:

```
psql:Data/pagila-star.sql:81509: ERROR:
                                         multiple primary keys for table "dimmovie" are not allo
                                         multiple primary keys for table "dimstore" are not allo
psql:Data/pagila-star.sql:81517: ERROR:
psql:Data/pagila-star.sql:81525: ERROR:
                                         multiple primary keys for table "factsales" are not all
                                         multiple primary keys for table "film_actor" are not al
psql:Data/pagila-star.sql:81533: ERROR:
                                         multiple primary keys for table "film_category" are not
psql:Data/pagila-star.sql:81541: ERROR:
                                         multiple primary keys for table "film" are not allowed
psql:Data/pagila-star.sql:81549: ERROR:
psql:Data/pagila-star.sql:81557: ERROR:
                                         multiple primary keys for table "inventory" are not all
psql:Data/pagila-star.sql:81565: ERROR:
                                         multiple primary keys for table "language" are not allo
                                         multiple primary keys for table "rental" are not allowed
psql:Data/pagila-star.sql:81573: ERROR:
psql:Data/pagila-star.sql:81581: ERROR:
                                         multiple primary keys for table "staff" are not allowed
psql:Data/pagila-star.sql:81589: ERROR:
                                         multiple primary keys for table "store" are not allowed
                                         relation "film_fulltext_idx" already exists
psql:Data/pagila-star.sql:81596: ERROR:
psql:Data/pagila-star.sql:81603: ERROR:
                                         relation "idx_actor_last_name" already exists
                                         relation "idx_fk_address_id" already exists
psql:Data/pagila-star.sql:81610: ERROR:
psql:Data/pagila-star.sql:81617: ERROR:
                                         relation "idx_fk_city_id" already exists
                                         relation "idx_fk_country_id" already exists
psql:Data/pagila-star.sql:81624: ERROR:
psql:Data/pagila-star.sql:81631: ERROR:
                                         relation "idx_fk_customer_id" already exists
                                         relation "idx_fk_film_id" already exists
psql:Data/pagila-star.sql:81638: ERROR:
psql:Data/pagila-star.sql:81645: ERROR:
                                         relation "idx_fk_inventory_id" already exists
psql:Data/pagila-star.sql:81652: ERROR:
                                         relation "idx_fk_language_id" already exists
                                         relation "idx_fk_original_language_id" already exists
psql:Data/pagila-star.sql:81659: ERROR:
psql:Data/pagila-star.sql:81666: ERROR:
                                         relation "idx_fk_payment_customer_id" already exists
psql:Data/pagila-star.sql:81673: ERROR:
                                         relation "idx_fk_payment_staff_id" already exists
                                         relation "idx_fk_store_id" already exists
psql:Data/pagila-star.sql:81680: ERROR:
psql:Data/pagila-star.sql:81687: ERROR:
                                         relation "idx_last_name" already exists
psql:Data/pagila-star.sql:81694: ERROR:
                                         relation "idx_store_id_film_id" already exists
psql:Data/pagila-star.sql:81701: ERROR:
                                         relation "idx_title" already exists
psql:Data/pagila-star.sql:81708: ERROR:
                                         relation "idx_unq_manager_staff_id" already exists
psql:Data/pagila-star.sql:81715: ERROR:
                                         relation "idx_unq_rental_rental_date_inventory_id_custo
psql:Data/pagila-star.sql:81722: ERROR:
                                         trigger "film_fulltext_trigger" for relation "film" alr
                                         trigger "last_updated" for relation "actor" already exi
psql:Data/pagila-star.sql:81729: ERROR:
psql:Data/pagila-star.sql:81736: ERROR:
                                         trigger "last_updated" for relation "address" already e
psql:Data/pagila-star.sql:81743: ERROR:
                                         trigger "last_updated" for relation "category" already
                                         trigger "last_updated" for relation "city" already exis
psql:Data/pagila-star.sql:81750: ERROR:
                                         trigger "last_updated" for relation "country" already e
psql:Data/pagila-star.sql:81757: ERROR:
psql:Data/pagila-star.sql:81764: ERROR:
                                          trigger "last_updated" for relation "customer" already
psql:Data/pagila-star.sql:81771: ERROR:
                                         trigger "last_updated" for relation "film" already exis
psql:Data/pagila-star.sql:81778: ERROR:
                                         trigger "last_updated" for relation "film_actor" alread
                                         trigger "last_updated" for relation "film_category" alr
psql:Data/pagila-star.sql:81785: ERROR:
psql:Data/pagila-star.sql:81792: ERROR:
                                          trigger "last_updated" for relation "inventory" already
                                         trigger "last_updated" for relation "language" already
psql:Data/pagila-star.sql:81799: ERROR:
                                         trigger "last_updated" for relation "rental" already ex
psql:Data/pagila-star.sql:81806: ERROR:
psql:Data/pagila-star.sql:81813: ERROR:
                                         trigger "last_updated" for relation "staff" already exi
                                         trigger "last_updated" for relation "store" already exi
psql:Data/pagila-star.sql:81820: ERROR:
                                         constraint "address_city_id_fkey" for relation "address
psql:Data/pagila-star.sql:81828: ERROR:
psql:Data/pagila-star.sql:81836: ERROR:
                                         constraint "city_country_id_fkey" for relation "city" a
psql:Data/pagila-star.sql:81844: ERROR:
                                         constraint "customer_address_id_fkey" for relation "cus
psql:Data/pagila-star.sql:81852: ERROR:
                                         constraint "customer_store_id_fkey" for relation "custo
```

```
psql:Data/pagila-star.sql:81860: ERROR:
                                         constraint "factsales_customer_key_fkey" for relation "
                                         constraint "factsales_date_key_fkey" for relation "fact
psql:Data/pagila-star.sql:81868: ERROR:
psql:Data/pagila-star.sql:81876: ERROR:
                                         constraint "factsales_movie_key_fkey" for relation "fac
psql:Data/pagila-star.sql:81884: ERROR:
                                         constraint "factsales_store_key_fkey" for relation "fac
                                         constraint "film_actor_actor_id_fkey" for relation "fil
psql:Data/pagila-star.sql:81892: ERROR:
psql:Data/pagila-star.sql:81900: ERROR:
                                         constraint "film_actor_film_id_fkey" for relation "film
psql:Data/pagila-star.sql:81908: ERROR:
                                         constraint "film_category_category_id_fkey" for relation
psql:Data/pagila-star.sql:81916: ERROR:
                                         constraint "film_category_film_id_fkey" for relation "f
                                         constraint "film_language_id_fkey" for relation "film"
psql:Data/pagila-star.sql:81924: ERROR:
psql:Data/pagila-star.sql:81932: ERROR:
                                         constraint "film_original_language_id_fkey" for relation
                                         constraint "inventory_film_id_fkey" for relation "inver
psql:Data/pagila-star.sql:81940: ERROR:
psql:Data/pagila-star.sql:81948: ERROR:
                                         constraint "inventory_store_id_fkey" for relation "inve
                                         constraint "payment_customer_id_fkey" for relation "pay
psql:Data/pagila-star.sql:81956: ERROR:
                                         constraint "payment_rental_id_fkey" for relation "payme
psql:Data/pagila-star.sql:81964: ERROR:
                                         constraint "payment_staff_id_fkey" for relation "paymer
psql:Data/pagila-star.sql:81972: ERROR:
                                         constraint "rental_customer_id_fkey" for relation "rent
psql:Data/pagila-star.sql:81980: ERROR:
psql:Data/pagila-star.sql:81988: ERROR:
                                         constraint "rental_inventory_id_fkey" for relation "ren
                                         constraint "rental_staff_id_fkey" for relation "rental"
psql:Data/pagila-star.sql:81996: ERROR:
psql:Data/pagila-star.sql:82004: ERROR:
                                         constraint "staff_address_id_fkey" for relation "staff"
psql:Data/pagila-star.sql:82012: ERROR:
                                         constraint "staff_store_id_fkey" for relation "staff" a
psql:Data/pagila-star.sql:82020: ERROR:
                                         constraint "store_address_id_fkey" for relation "store"
```

1.0.1 Connect to the local database where Pagila is loaded

```
In [7]: import sql
        %load_ext sql
        DB_ENDPOINT = "127.0.0.1"
        DB = 'pagila_star'
        DB_USER = 'student'
        DB_PASSWORD = 'student'
        DB_PORT = '5432'
        \# postgresql://username:password@host:port/database
        conn_string = "postgresql://{}:{}@{}:{}/{}" \
                                 .format(DB_USER, DB_PASSWORD, DB_ENDPOINT, DB_PORT, DB)
        print(conn_string)
        %sql $conn_string
The sql extension is already loaded. To reload it, use:
  %reload_ext sql
postgresql://student:student@127.0.0.1:5432/pagila_star
Out[7]: 'Connected: student@pagila_star'
```

1.0.2 Star Schema

2 Start with a simple cube

TODO: Write a query that calculates the revenue (sales_amount) by day, rating, and city. Remember to join with the appropriate dimension tables to replace the keys with the dimension labels. Sort by revenue in descending order and limit to the first 20 rows. The first few rows of your output should match the table below.

```
In [8]: %%time
        %%sql
        SELECT day, rating, city, SUM(sales_amount) AS revenue
        FROM factsales
        JOIN dimdate ON (factsales.date_key=dimdate.date_key)
        JOIN dimmovie ON (factsales.movie_key=dimmovie.movie_key)
        JOIN dimCustomer ON (dimCustomer.customer_key = factSales.customer_key)
        GROUP BY day, rating, city
        ORDER BY revenue DESC
        LIMIT 20
* postgresql://student:***@127.0.0.1:5432/pagila_star
20 rows affected.
CPU times: user 4.23 ms, sys: 677 ts, total: 4.91 ms
Wall time: 36.6 ms
Out[8]: [(30, 'G', 'San Bernardino', Decimal('24.97')),
         (30, 'NC-17', 'Apeldoorn', Decimal('23.95')),
         (21, 'NC-17', 'Belm', Decimal('22.97')),
         (28, 'R', 'Mwanza', Decimal('21.97')),
         (21, 'G', 'Citt del Vaticano', Decimal('21.97')),
         (30, 'PG-13', 'Zanzibar', Decimal('21.97')),
         (1, 'R', 'Qomsheh', Decimal('19.97')),
         (22, 'R', 'Yangor', Decimal('19.97')),
         (28, 'PG-13', 'Dhaka', Decimal('19.97')),
         (17, 'G', 'Rajkot', Decimal('19.97')),
         (19, 'PG', 'Najafabad', Decimal('19.96')),
         (30, 'R', 'Fengshan', Decimal('19.95')),
         (28, 'PG', 'So Leopoldo', Decimal('18.98')),
         (21, 'G', 'Wroclaw', Decimal('18.98')),
         (1, 'NC-17', 'Memphis', Decimal('18.97')),
         (30, 'PG-13', 'Osmaniye', Decimal('18.97')),
         (29, 'PG-13', 'Shimoga', Decimal('18.97')),
         (19, 'PG', 'Sokoto', Decimal('18.97')),
         (30, 'G', 'Omdurman', Decimal('18.97')),
         (21, 'PG-13', 'Asuncin', Decimal('18.95'))]
```

```
day
 rating
 city
 revenue
30
 G
 San Bernardino
 24.97
30
 NC-17
 Apeldoorn
 23.95
21
 NC-17
 Belm
 22.97
30
 PG-13
 Zanzibar
 21.97
28
 R
 Mwanza
 21.97
```

2.1 Slicing

Slicing is the reduction of the dimensionality of a cube by 1 e.g. 3 dimensions to 2, fixing one of the dimensions to a single value. In the example above, we have a 3-dimensional cube on day, rating, and country.

TODO: Write a query that reduces the dimensionality of the above example by limiting the results to only include movies with a rating of "PG-13". Again, sort by revenue in descending order and limit to the first 20 rows. The first few rows of your output should match the table below.

```
SELECT dimdate.day, dimmovie.rating, dimcustomer.city, SUM(factsales.sales_amount) AS r
         FROM factsales
         JOIN dimdate ON (factsales.date_key=dimdate.date_key)
         JOIN dimmovie ON (factsales.movie_key=dimmovie.movie_key)
         JOIN dimcustomer ON (factsales.customer_key=dimcustomer.customer_key)
         WHERE dimmovie.rating='PG-13'
         GROUP BY dimdate.day, dimmovie.rating, dimcustomer.city
         ORDER BY revenue DESC
 * postgresql://student:***@127.0.0.1:5432/pagila_star
3107 rows affected.
CPU times: user 10.4 ms, sys: 0 ns, total: 10.4 ms
Wall time: 22.5 ms
Out[12]: [(30, 'PG-13', 'Zanzibar', Decimal('21.97')),
          (28, 'PG-13', 'Dhaka', Decimal('19.97')),
          (29, 'PG-13', 'Shimoga', Decimal('18.97')),
          (30, 'PG-13', 'Osmaniye', Decimal('18.97')),
          (21, 'PG-13', 'Asuncin', Decimal('18.95')),
          (20, 'PG-13', 'Baha Blanca', Decimal('17.98')),
          (30, 'PG-13', 'Nagareyama', Decimal('17.98')),
          (21, 'PG-13', 'Parbhani', Decimal('17.98')),
          (30, 'PG-13', 'Tanauan', Decimal('17.96')),
          (17, 'PG-13', 'Ikerre', Decimal('17.95')),
          (30, 'PG-13', 'Zhoushan', Decimal('16.98')),
          (30, 'PG-13', 'Yerevan', Decimal('16.97')),
          (30, 'PG-13', 'Newcastle', Decimal('16.97')),
          (20, 'PG-13', 'Santa Rosa', Decimal('15.98')),
          (30, 'PG-13', 'Santa Rosa', Decimal('15.98')),
          (17, 'PG-13', 'Yantai', Decimal('15.98')),
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  city
  revenue
30
  PG-13
  Zanzibar
  21.97
28
  PG-13
  Dhaka
  19.97
29
  PG-13
  Shimoga
  18.97
30
  PG-13
  Osmaniye
  18.97
21
  PG-13
  Asuncin
  18.95
```

2.2 Dicing

1

Dicing is creating a subcube with the same dimensionality but fewer values for two or more dimensions.

TODO: Write a query to create a subcube of the initial cube that includes moves with: * ratings of PG or PG-13 * in the city of Bellevue or Lancaster * day equal to 1, 15, or 30

The first few rows of your output should match the table below.

```
In [14]: %%time
        %%sql
        SELECT dimdate.day, dimmovie.rating, dimcustomer.city, SUM(factsales.sales_amount) AS r
        FROM factsales
        JOIN dimdate ON (factsales.date_key=dimdate.date_key)
        JOIN dimmovie ON (factsales.movie_key=dimmovie.movie_key)
        JOIN dimcustomer ON (factsales.customer_key=dimcustomer.customer_key)
        WHERE dimmovie.rating IN('PG-13', 'PG')
        AND dimcustomer.city IN ('Bellevue', 'Lancaster')
        AND dimdate.day IN (1, 15, 30)
        GROUP BY dimdate.day, dimmovie.rating, dimcustomer.city
        ORDER BY revenue DESC
* postgresql://student:***@127.0.0.1:5432/pagila_star
6 rows affected.
CPU times: user 2.35 ms, sys: 3.31 ms, total: 5.66 ms
Wall time: 10.1 ms
Out[14]: [(30, 'PG', 'Lancaster', Decimal('12.98')),
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day
   rating
   city
   revenue
30
   PG
   Lancaster
   12.98
```

```
PG-13
 Lancaster
 5.99
30
 PG-13
 Bellevue
 3.99
30
 PG-13
 Lancaster
 2.99
15
 PG-13
 Bellevue
 1.98
```