UTS
UNIVERSITY OF TECHNOLOGY SYDNEY

Faculty of Engineering & Information Technology

42901 - Object-Relational Databases

DATABASE DESIGN AND IMPLEMENTATION

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1.INTRODUCTION

The assignment mainly focuses on analyze, design and implementation of an Online Music Database (OMDB) which stores and maintains a variety of information about music albums and its attributes enclosed to be purchased from an online store. This database designed here supports a website that helps the users to query the information and search albums based on their need. Since the Database also possess important information about the albums like album artists, album genre, no of tracks, album release date, the format i.e. CDs, Vinyl records or in Mp3 from which the album is released or available to download and their respective information. Moreover, the data in the database is being populated with all the above-mentioned attributes which gives complete descriptions about the album and its types.

ONLINE MUSIC DATABASE (OMDB)

A brief description about each column and its respective attributes in the online Music Database (OMDB) is shown from the below table,

Column Name	Description
Album Title	Title of the album
Album Playtime	Playtime of the album in minutes
Album Release Date	Data of release of the album
Album Genre	Genre of the album
Album Price	Price of a new album with respect to the album type (audio CD, Vinyl, or MP3)
Album Tracks	No of tracks of the album
Album Artists	Artists involved in making the album Contains information of Artist Name and Role.
Album Reviews	Reviews of the album. Contains information about name, date of album reviewed, Comments and Review score.

Further Two subtypes Disk_type and mp3_type is created which holds respective information of their types. The Disk_type holds Type (either Audio CD or Vinyl), number of Disks, Disk Used Price, Delivery cost and Mp3_type has Download Size information enclosed in it.

This next section of the report contains the Entity-Relationship diagram which represents all the entities, relationships involved, attributes, identifiers and their cardinalities. Further this ERD diagram is being converted into Relational design using Data modeler.

2.1 ENTITY- RELATIONSHIP MODEL

The Information requirements of the OMDB is analyzed completely and is shown in the entity relationship model which helps in design and implementation of the Database. This ERD model shows all the important entities, attributes, identifiers and their respective cardinalities. Further the subtypes Disk_type and mp3_type is also shown appropriately.

Some of the important decisions made before implementing the database are listed as follows,

- To implement this online music database various entities and attributes are being chosen along with two subtypes. The entities used in building this model are artist_type, artist_Array_type, album_type, disk_type and mp3_type.
- The album title, Playtime, Release data, Genre, price, Number of Tracks are all stored in the entity Album_type.
- Moreover, the album_type will have subtypes disk_type and Mp3_type associated with respective information about the albums in Disk type and mp3 type stored.
- Album_type has two collections Album artists - a variable array and Album review which holds the information of Reviewer name, data, Text and score of the album.
- The album artists are a variable array type which can records the information of about 5 artists with artist name and role as the attributes. Further the artist can have many roles for like musician and vocals together for the same album.

The Logical Model of the Database along with all the relationships and cardinalities are shown from the following figure,

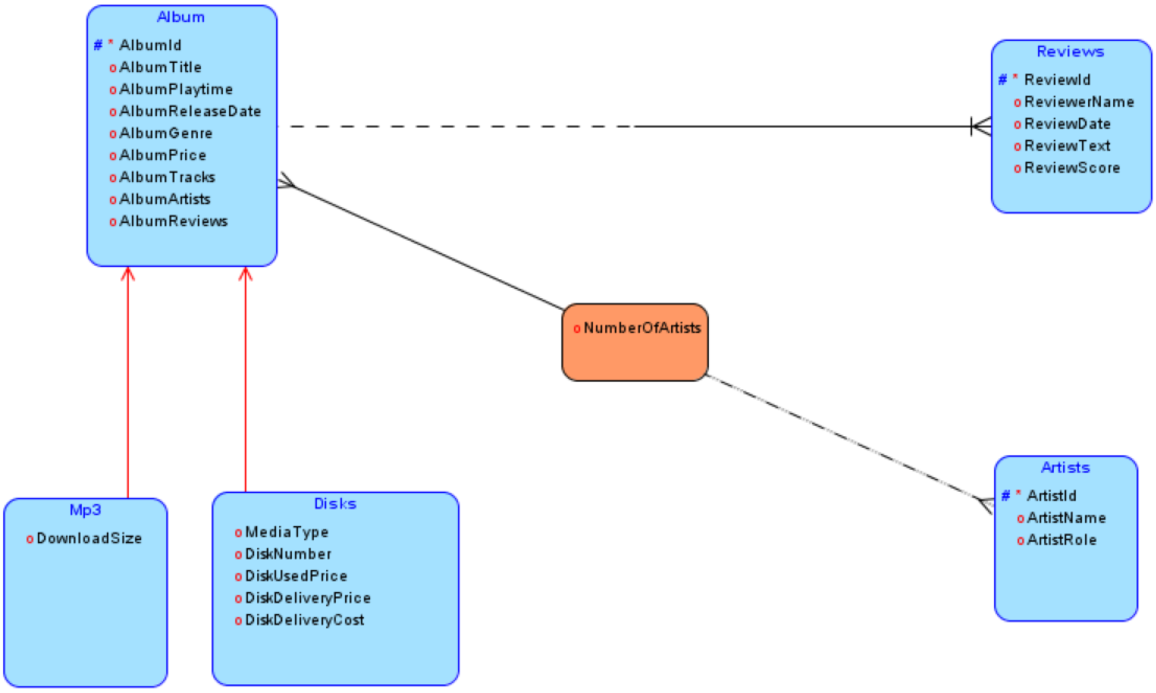


Figure 1: Entity Relationship Diagram

- The album_type entity has two subtypes, Disk_type and mp3_type where each has different attributes associated with each type.
- Disk_type has attributes like MediaType which shows whether the album is of Vinyl or Audio_cd disktype, Disk Number - which gives the number of disks of that album. Disk Used price -Price of the used disks, and it would be null if the disk is new, Disk_delivery_Costs which gives the shipping cost of that album involved.
- Mp3_type attribute contains the information of the recorded size as they are completely processed online.
- The logical model describes each entity and the relationships that are established in addition to both of the transactional and operational data entities. Moreover, the ERD model utilizes Barker Notations.
- Using Data Modeler This Logical Model is converted into Relational Model i.e into a set of corresponding tables.

RELATIONAL MODEL

The Entity-Relational Model is then converted into Relational Model which is represented by a set of tables of existing logical model. This makes that the tables formed are in Boyce Codd Normal Form (BCNF). The relational Model for the online music database can be shown as,

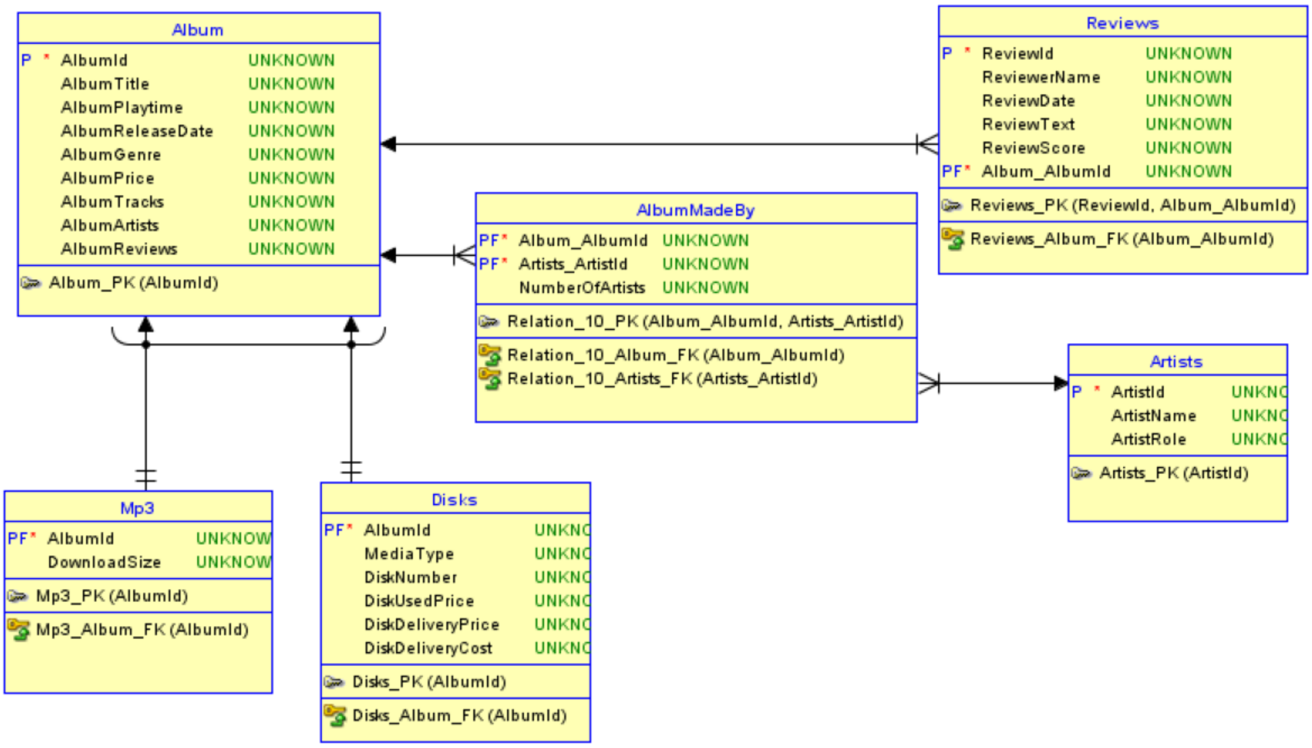


Figure 2:Relational Model Table diagram for OMDB

2.2 OBJECT-RELATIONAL MODEL

The next phase after design is the implementation of the Online Musical Database (OMDB). The Database is being populated with context according to the intended requirements and needs of the assignment. The database is validated twice after all the entities are populated to ensure proper output is obtained.

We have used Oracle 11g, DDL (Data Definition Language) scripts and DML (Data Manipulation Language) scripts for designing and implementation of the OMDB. A brief Explanation about them is as follows,

- DROP TABLE
- DROP TYPE
- Create Table and Type
- INSERT Values into the table
- Create V-array and User Defined types.
- Retrieve the required data using Queries

The first Step in defining the DDL which helps in defining the different structures of the database. Before creating the DB, it is always recommended to drop the Contents of the existing tables or types that we need or to be created type in a sequential manner. This is mainly to avoid our tables or types getting disrupt by the existing entries with same table name or and then create them for OMDB.

Secondly DML comes into existence, where the tables and respective types are created, and the values are populated into the database using respective insert commands. There are other set of statements used as part of DML some of them are listed below,

```
   1. NOT FINAL :
      For E.g.
      create or replace type album_type as object
      (albumTitle       varchar(50),
       albumPlaytime          number(3), -- minutes
       albumReleaseDate date,
       albumGenre       varchar(15),
       albumPrice       number(9,2),
       albumTracks      number(2),
       albumArtists           artist_array_type,
       albumReviews           review_table_type,
       member function discountPrice return number,
       member function containsText (pString1 varchar2, pString2 varchar2)
return integer)
      not instantiable not final
      /
```

The Not Final mentioned here is to let the Album_type have subtypes. Since the Oracle by default considers Final which would prohibit the type from having subtypes.
Thus, the album_type here has two subtypes disk_type and Mp3_type.

2. V-Arrrays:
   The Artist_type here is mentioned with varray(5) which enables the user to embed 5 homogenous data in the array . This has been predefined to enable the user in inserting the values while populating the database.

```
/
create type artist_array_type
as varray(5) of artist_type
/
```

3. User Defined Types:

   There are certain object and collection types used which are built- in which actually forms the building blocks for the behavior of data and its respective applications.

The Entire Script of the OMDB is enclosed in the Appendix section.

Methods containsText and discountPrice are later invoked while creating the views and retrieving certain information from the database. This will be explained in the next section of methods and queries.

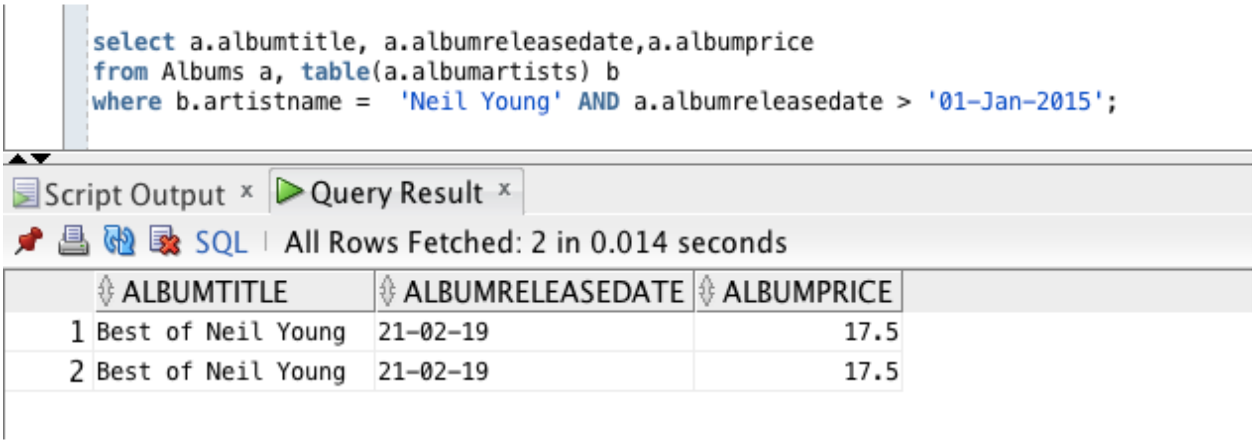
2.3 OMDB METHODS & QUERIES

1. Give album title, album release date and album price of all Neil Young's albums released after 1st January 2015.

Query :

```
select a.albumtitle, a.albumreleasedate,a.albumprice

from Albums a, table(a.albumartists) b

where b.artistname =  'Neil Young' AND a.albumreleasedate > '01-Jan-2015';
```

Result :



```
select a.albumtitle, a.albumreleasedate,a.albumprice
from Albums a, table(a.albumartists) b
where b.artistname =  'Neil Young' AND a.albumreleasedate > '01-Jan-2015';
```

All Rows Fetched: 2 in 0.014 seconds

	ALBUMTITLE	ALBUMRELEASEDATE	ALBUMPRICE
1	Best of Neil Young	21-02-19	17.5
2	Best of Neil Young	21-02-19	17.5

2.Give album title and artist name for albums released only in MP3 format. Order by album title.

Query:

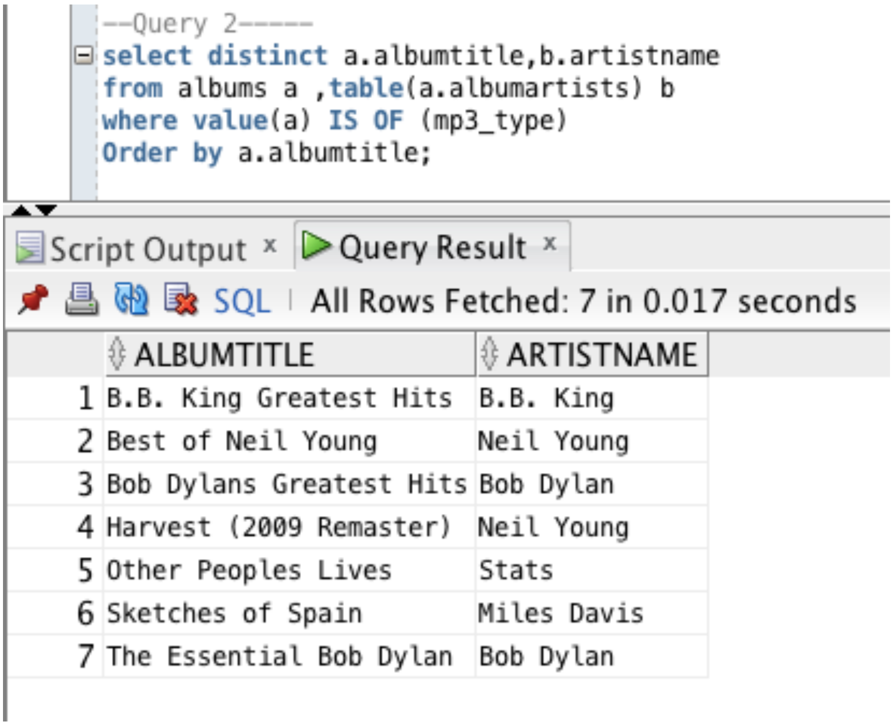
select distinct a.albumtitle,b.artistname

from albums a ,table(a.albumartists) b

where value(a) IS OF (mp3_type)

Order by a.albumtitle;

Result :



```
--Query 2-----
select distinct a.albumtitle,b.artistname
from albums a ,table(a.albumartists) b
where value(a) IS OF (mp3_type)
Order by a.albumtitle;
```

All Rows Fetched: 7 in 0.017 seconds

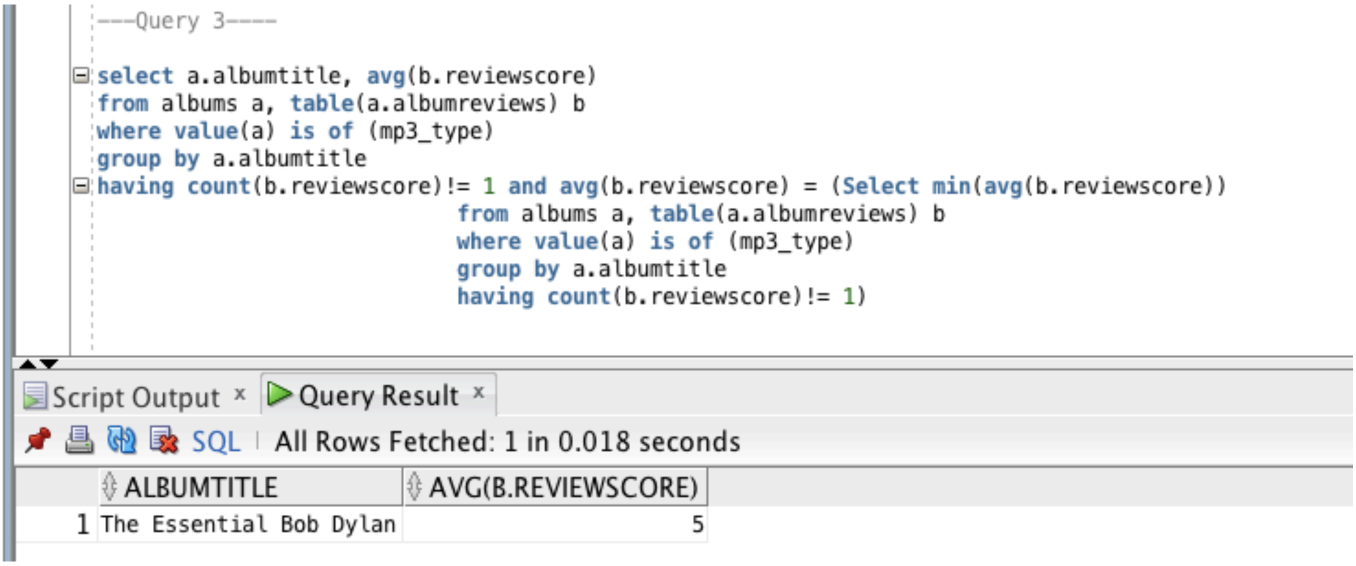
	ALBUMTITLE	ARTISTNAME
1	B.B. King Greatest Hits	B.B. King
2	Best of Neil Young	Neil Young
3	Bob Dylans Greatest Hits	Bob Dylan
4	Harvest (2009 Remaster)	Neil Young
5	Other Peoples Lives	Stats
6	Sketches of Spain	Miles Davis
7	The Essential Bob Dylan	Bob Dylan

3.Give lowest rated MP3 album (i.e. album with the lowest average review score). Show album title and the average score. Exclude albums with only one review.

Query :

```
select a.albumtitle, avg(b.reviewscore)
from albums a, table(a.albumreviews) b
where value(a) is of (mp3_type)
group by a.albumtitle
having count(b.reviewscore)!= 1 and avg(b.reviewscore) = (Select min(avg(b.reviewscore))
                from albums a, table(a.albumreviews) b
                where value(a) is of (mp3_type)
                group by a.albumtitle
                having count(b.reviewscore)!= 1);
```

Result :



```
---Query 3----

select a.albumtitle, avg(b.reviewscore)
from albums a, table(a.albumreviews) b
where value(a) is of (mp3_type)
group by a.albumtitle
having count(b.reviewscore)!= 1 and avg(b.reviewscore) = (Select min(avg(b.reviewscore))
                                    from albums a, table(a.albumreviews) b
                                    where value(a) is of (mp3_type)
                                    group by a.albumtitle
                                    having count(b.reviewscore)!= 1)
```

All Rows Fetched: 1 in 0.018 seconds

```
    ALBUMTITLE              AVG(B.REVIEWSCORE)
  1 The Essential Bob Dylan                  5
```

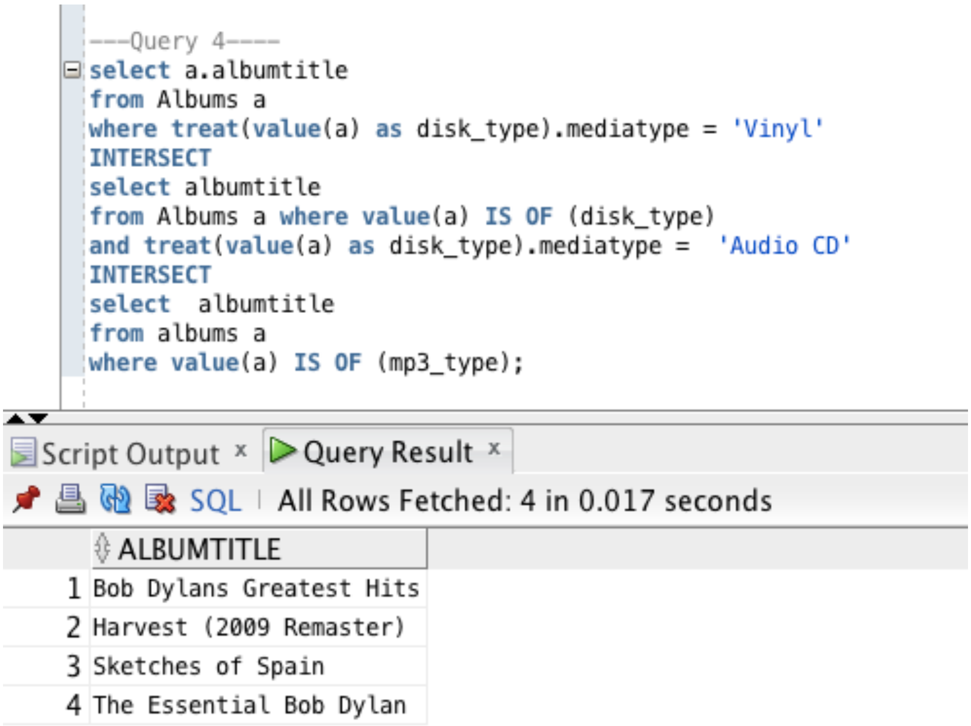
4.Are there any albums released on all media, i.e. on MP3, audio CD and vinyl? Show album title and order by album title.

Query :

```
select a.albumtitle

from Albums a

where treat(value(a) as disk_type).mediatype = 'Vinyl'

INTERSECT

select albumtitle
```

```
from Albums a where value(a) IS OF (disk_type)

and treat(value(a) as disk_type).mediatype =  'Audio CD'

INTERSECT

select  albumtitle

from albums a

where value(a) IS OF (mp3_type);
```

Result :



```
---Query 4----
select a.albumtitle
from Albums a
where treat(value(a) as disk_type).mediatype = 'Vinyl'
INTERSECT
select albumtitle
from Albums a where value(a) IS OF (disk_type)
and treat(value(a) as disk_type).mediatype =  'Audio CD'
INTERSECT
select  albumtitle
from albums a
where value(a) IS OF (mp3_type);
```

All Rows Fetched: 4 in 0.017 seconds

```
  ALBUMTITLE
1 Bob Dylans Greatest Hits
2 Harvest (2009 Remaster)
3 Sketches of Spain
4 The Essential Bob Dylan
```

5.Implement the method discountPrice() that returns a discounted price using the following business rule:

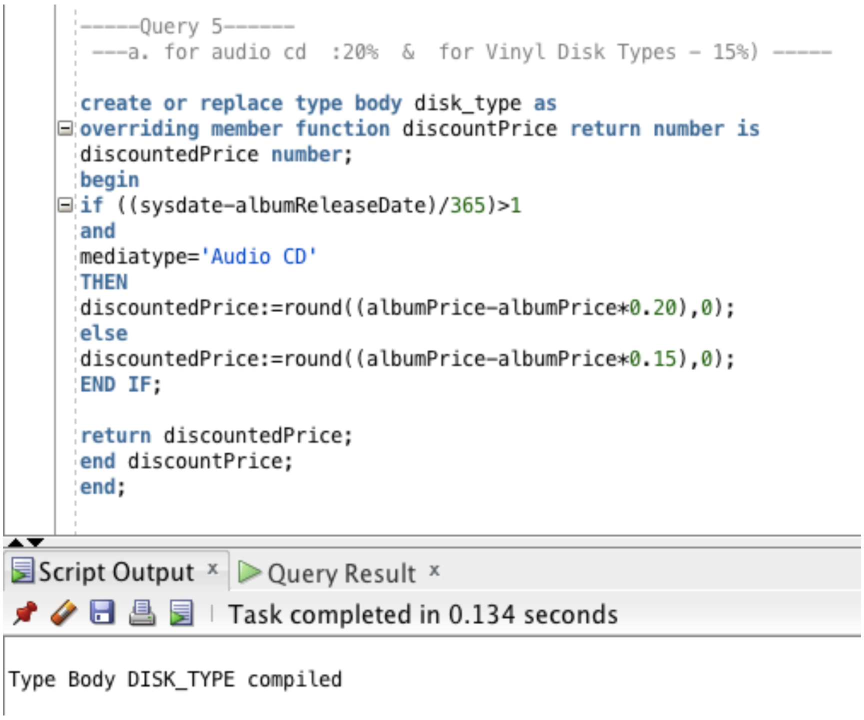
- for audio CDs released more than one year ago the discount is 20% & for vinyl records released more than one year ago the discount is 15%

  Query :

  ```
  create or replace type body disk_type as
  overriding member function discountPrice return number is
  discountedPrice number;
  begin
  if ((sysdate-albumReleaseDate)/365)>1
  ```

```
and
mediatype='Audio CD'
THEN
discountedPrice:=round((albumPrice-albumPrice*0.20),0);
else
discountedPrice:=round((albumPrice-albumPrice*0.15),0);
END IF;

return discountedPrice;
end discountPrice;
end;
```

Result :



```
-----Query 5------
 ---a. for audio cd  :20%  &  for Vinyl Disk Types - 15%) -----

create or replace type body disk_type as
overriding member function discountPrice return number is
discountedPrice number;
begin
if ((sysdate-albumReleaseDate)/365)>1
and
mediatype='Audio CD'
THEN
discountedPrice:=round((albumPrice-albumPrice*0.20),0);
else
discountedPrice:=round((albumPrice-albumPrice*0.15),0);
END IF;

return discountedPrice;
end discountPrice;
end;
```

Task completed in 0.134 seconds

```
Type Body DISK_TYPE compiled
```

c.For MP3 downloads released more than two years ago the discount is 10%

Query :

```
create or replace type body mp3_type as

overriding member function discountPrice return number is

discountedPrice number;

begin

if ((sysdate-albumReleaseDate)/365)> 2 THEN

discountedPrice:=round((albumPrice-albumPrice*0.10),0);
```

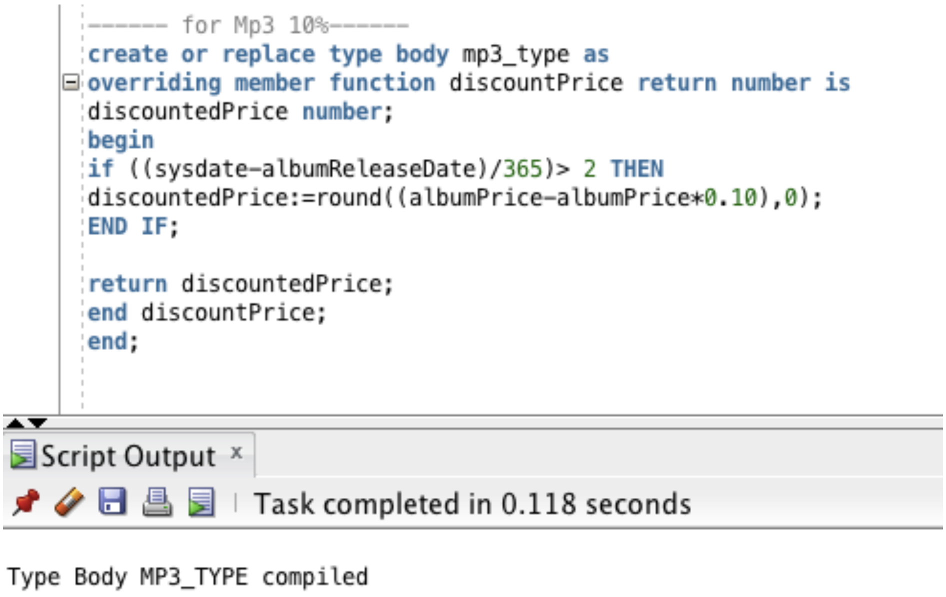
END IF;

return discountedPrice;

end discountPrice;

end;

Result :



```
------ for Mp3 10%------
create or replace type body mp3_type as
overriding member function discountPrice return number is
discountedPrice number;
begin
if ((sysdate-albumReleaseDate)/365)> 2 THEN
discountedPrice:=round((albumPrice-albumPrice*0.10),0);
END IF;

return discountedPrice;
end discountPrice;
end;
```

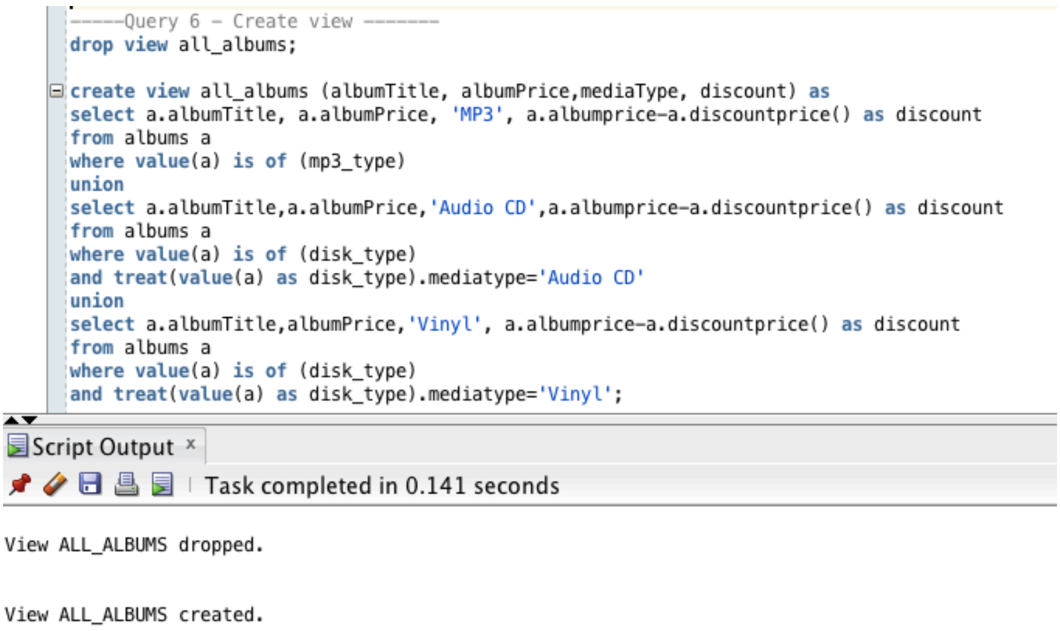
Task completed in 0.118 seconds

```
Type Body MP3_TYPE compiled
```

6. Create a view all_albums that includes the columns: album title, media type ('MP3', ‘Vinyl’, ‘Audio CD’), album price, and discount (album price – discount price). Use this view to find the album that received the largest discount; show all view columns.

Query:

```
create view all_albums (albumTitle, albumPrice,mediaType, discount) as
select a.albumTitle, a.albumPrice, 'MP3', a.albumprice-a.discountprice() as discount
from albums a
where value(a) is of (mp3_type)
union
select a.albumTitle,a.albumPrice,'Audio CD',a.albumprice-a.discountprice() as discount
from albums a
where value(a) is of (disk_type)
and treat(value(a) as disk_type).mediatype='Audio CD'
union
select a.albumTitle,albumPrice,'Vinyl', a.albumprice-a.discountprice() as discount
from albums a
where value(a) is of (disk_type)
and treat(value(a) as disk_type).mediatype='Vinyl';
```

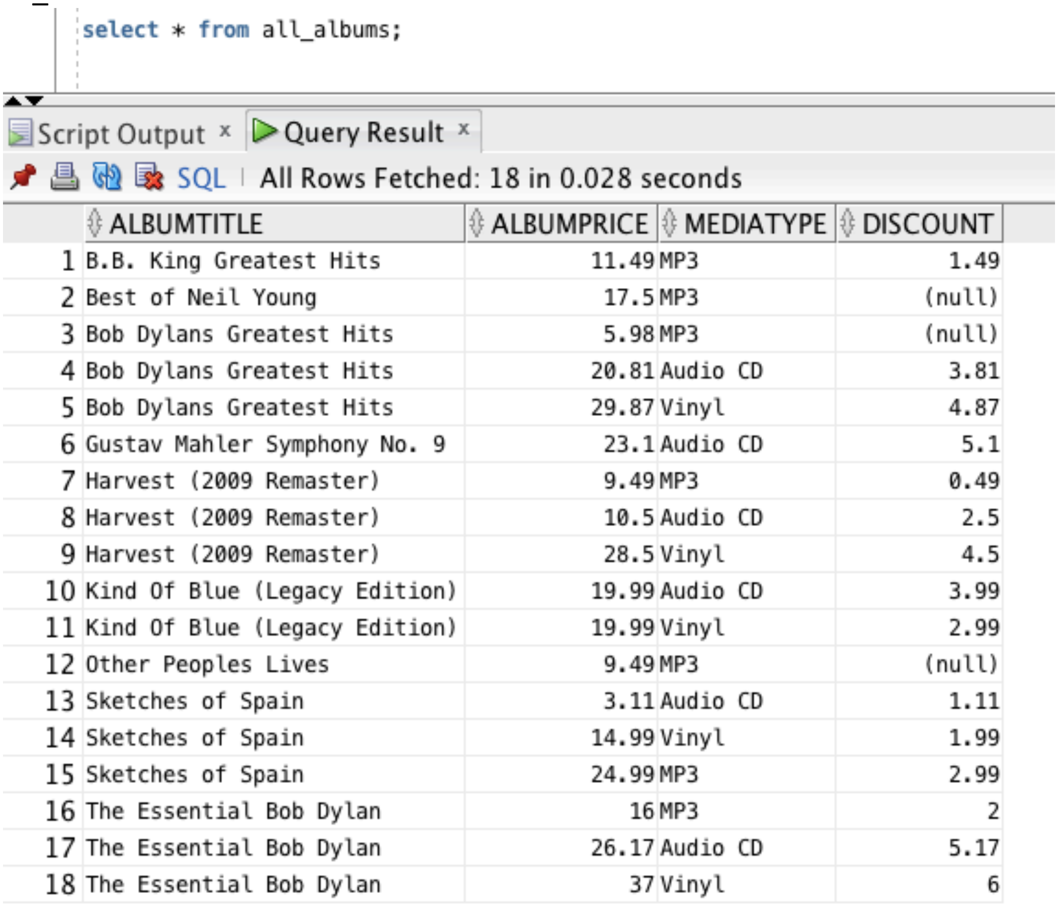


```
-----Query 6 - Create view -------
drop view all_albums;

create view all_albums (albumTitle, albumPrice,mediaType, discount) as
select a.albumTitle, a.albumPrice, 'MP3', a.albumprice-a.discountprice() as discount
from albums a
where value(a) is of (mp3_type)
union
select a.albumTitle,a.albumPrice,'Audio CD',a.albumprice-a.discountprice() as discount
from albums a
where value(a) is of (disk_type)
and treat(value(a) as disk_type).mediatype='Audio CD'
union
select a.albumTitle,albumPrice,'Vinyl', a.albumprice-a.discountprice() as discount
from albums a
where value(a) is of (disk_type)
and treat(value(a) as disk_type).mediatype='Vinyl';
```

Task completed in 0.141 seconds

```
View ALL_ALBUMS dropped.


View ALL_ALBUMS created.
```

View All_albums:

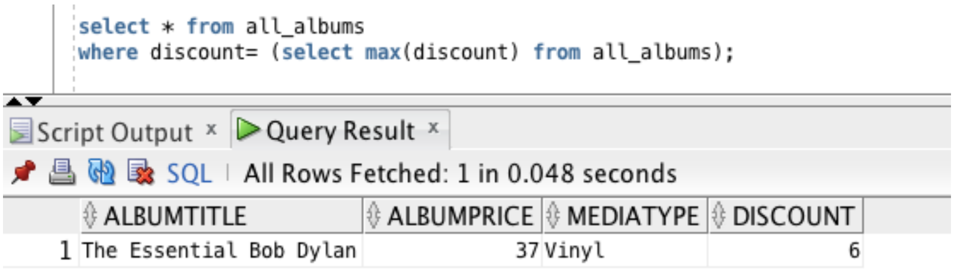


```
select * from all_albums;
```

All Rows Fetched: 18 in 0.028 seconds

	ALBUMTITLE	ALBUMPRICE	MEDIATYPE	DISCOUNT
1	B.B. King Greatest Hits	11.49	MP3	1.49
2	Best of Neil Young	17.5	MP3	(null)
3	Bob Dylans Greatest Hits	5.98	MP3	(null)
4	Bob Dylans Greatest Hits	20.81	Audio CD	3.81
5	Bob Dylans Greatest Hits	29.87	Vinyl	4.87
6	Gustav Mahler Symphony No. 9	23.1	Audio CD	5.1
7	Harvest (2009 Remaster)	9.49	MP3	0.49
8	Harvest (2009 Remaster)	10.5	Audio CD	2.5
9	Harvest (2009 Remaster)	28.5	Vinyl	4.5
10	Kind Of Blue (Legacy Edition)	19.99	Audio CD	3.99
11	Kind Of Blue (Legacy Edition)	19.99	Vinyl	2.99
12	Other Peoples Lives	9.49	MP3	(null)
13	Sketches of Spain	3.11	Audio CD	1.11
14	Sketches of Spain	14.99	Vinyl	1.99
15	Sketches of Spain	24.99	MP3	2.99
16	The Essential Bob Dylan	16	MP3	2
17	The Essential Bob Dylan	26.17	Audio CD	5.17
18	The Essential Bob Dylan	37	Vinyl	6

The album that received the highest discount is ‘The Essential Bob Dylan’ With a discount value of 6.



```
select * from all_albums
where discount= (select max(discount) from all_albums);
```

All Rows Fetched: 1 in 0.048 seconds

	ALBUMTITLE	ALBUMPRICE	MEDIATYPE	DISCOUNT
1	The Essential Bob Dylan	37	Vinyl	6

7. Now, modify the view all_albums to also include the column album used price for disks; set album used price to zero for MP3 albums. Use this view to find the most expensive used album; show all view columns

Query :

create view all_albums (albumTitle, albumPrice,mediaType, discount, albumUsedPrice) as

select a.albumTitle, a.albumPrice, 'MP3', a.albumprice-a.discountprice(),0

from albums a

where value(a) is of (mp3_type)

union

select a.albumTitle,a.albumPrice,'Audio CD', a.albumprice-a.discountprice(), treat(value(a) as

disk_type).diskusedprice

from albums a

where value(a) is of (disk_type)

and treat(value(a) as disk_type).mediatype='Audio CD'

union

select a.albumTitle,albumPrice, 'Vinyl', a.albumprice-a.discountprice(), treat(value(a) as

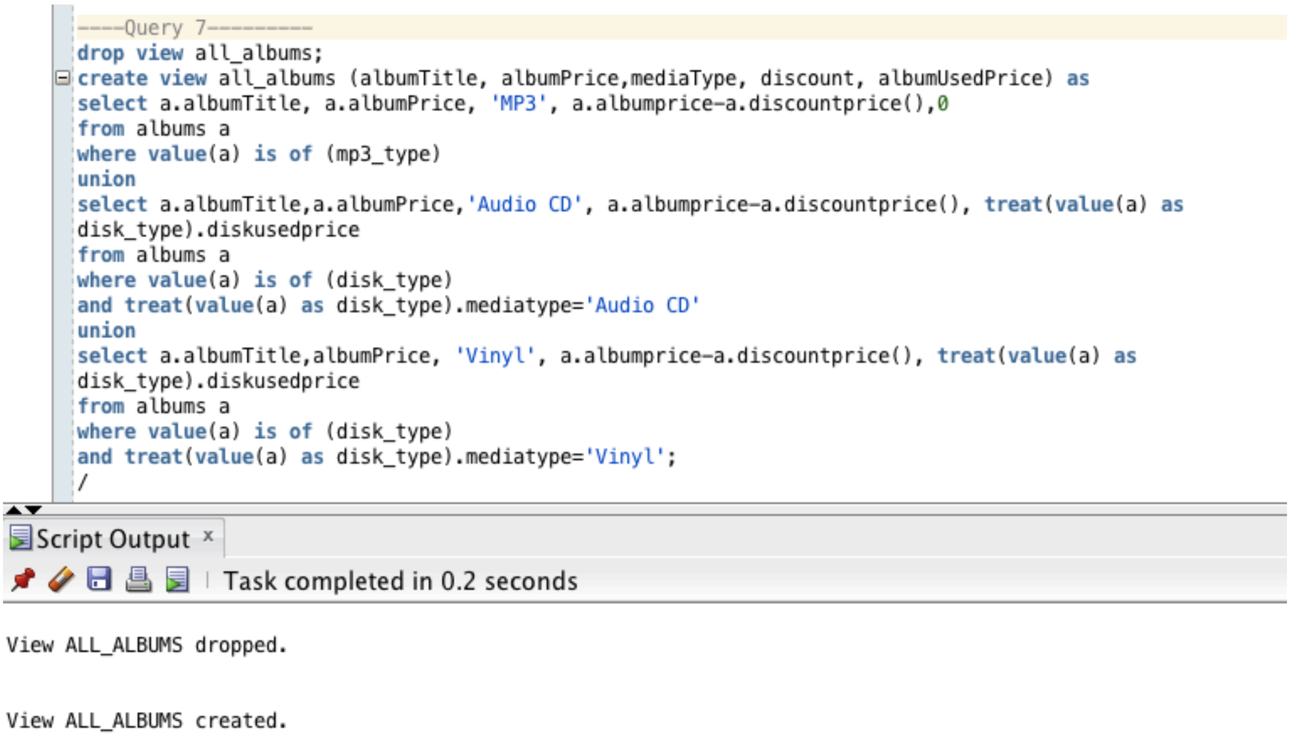
disk_type).diskusedprice

from albums a

where value(a) is of (disk_type)

and treat(value(a) as disk_type).mediatype='Vinyl';

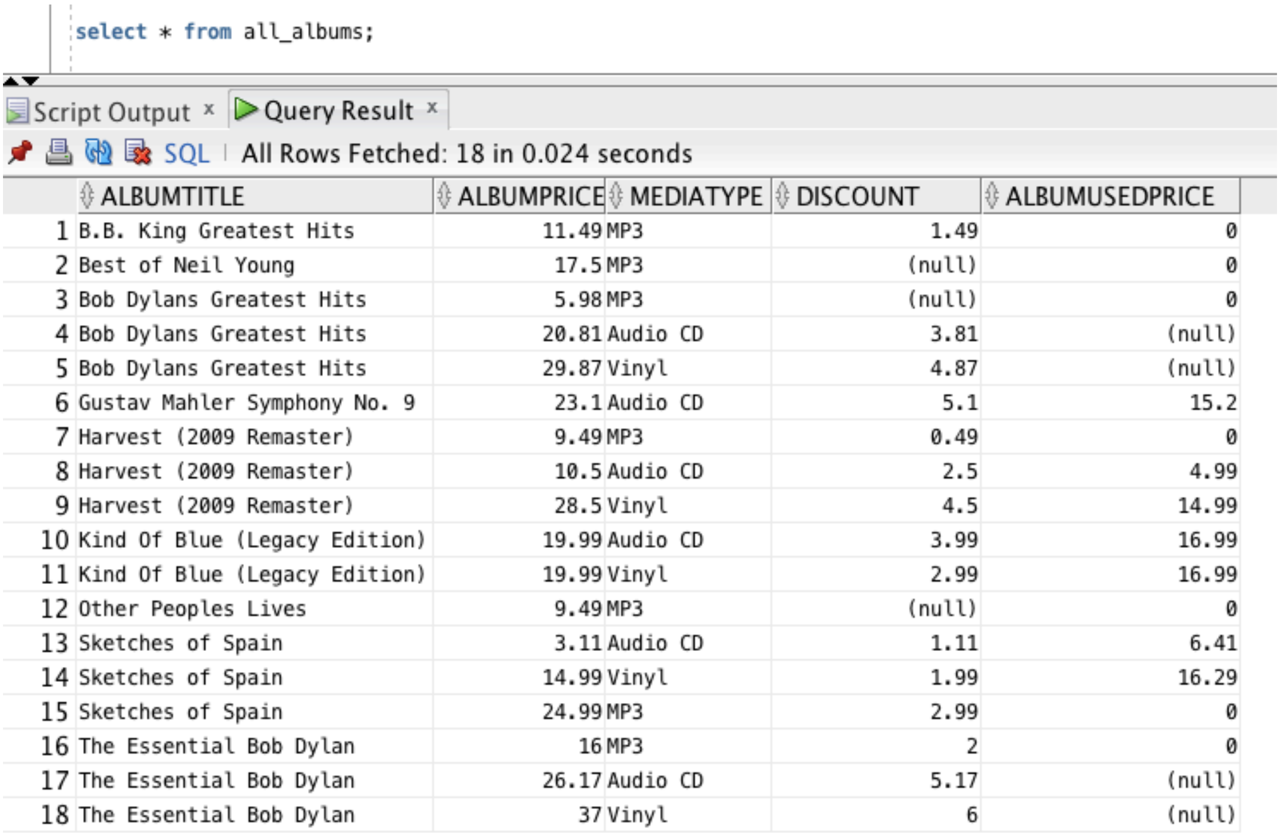
Result:



```
----Query 7----------
drop view all_albums;
create view all_albums (albumTitle, albumPrice,mediaType, discount, albumUsedPrice) as
select a.albumTitle, a.albumPrice, 'MP3', a.albumprice-a.discountprice(),0
from albums a
where value(a) is of (mp3_type)
union
select a.albumTitle,a.albumPrice,'Audio CD', a.albumprice-a.discountprice(), treat(value(a) as
disk_type).diskusedprice
from albums a
where value(a) is of (disk_type)
and treat(value(a) as disk_type).mediatype='Audio CD'
union
select a.albumTitle,albumPrice, 'Vinyl', a.albumprice-a.discountprice(), treat(value(a) as
disk_type).diskusedprice
from albums a
where value(a) is of (disk_type)
and treat(value(a) as disk_type).mediatype='Vinyl';
/
```

Task completed in 0.2 seconds

```
View ALL_ALBUMS dropped.


View ALL_ALBUMS created.
```

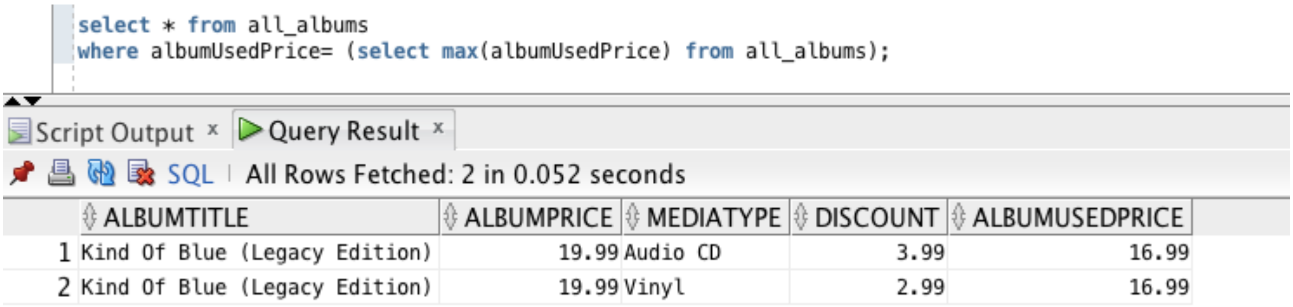


```
select * from all_albums;
```

All Rows Fetched: 18 in 0.024 seconds

	ALBUMTITLE	ALBUMPRICE	MEDIATYPE	DISCOUNT	ALBUMUSEDPRICE
1	B.B. King Greatest Hits	11.49	MP3	1.49	0
2	Best of Neil Young	17.5	MP3	(null)	0
3	Bob Dylans Greatest Hits	5.98	MP3	(null)	0
4	Bob Dylans Greatest Hits	20.81	Audio CD	3.81	(null)
5	Bob Dylans Greatest Hits	29.87	Vinyl	4.87	(null)
6	Gustav Mahler Symphony No. 9	23.1	Audio CD	5.1	15.2
7	Harvest (2009 Remaster)	9.49	MP3	0.49	0
8	Harvest (2009 Remaster)	10.5	Audio CD	2.5	4.99
9	Harvest (2009 Remaster)	28.5	Vinyl	4.5	14.99
10	Kind Of Blue (Legacy Edition)	19.99	Audio CD	3.99	16.99
11	Kind Of Blue (Legacy Edition)	19.99	Vinyl	2.99	16.99
12	Other Peoples Lives	9.49	MP3	(null)	0
13	Sketches of Spain	3.11	Audio CD	1.11	6.41
14	Sketches of Spain	14.99	Vinyl	1.99	16.29
15	Sketches of Spain	24.99	MP3	2.99	0
16	The Essential Bob Dylan	16	MP3	2	0
17	The Essential Bob Dylan	26.17	Audio CD	5.17	(null)
18	The Essential Bob Dylan	37	Vinyl	6	(null)

The most expensive used album is Kind of Blue (Legacy Edition).



```
select * from all_albums
where albumUsedPrice= (select max(albumUsedPrice) from all_albums);
```

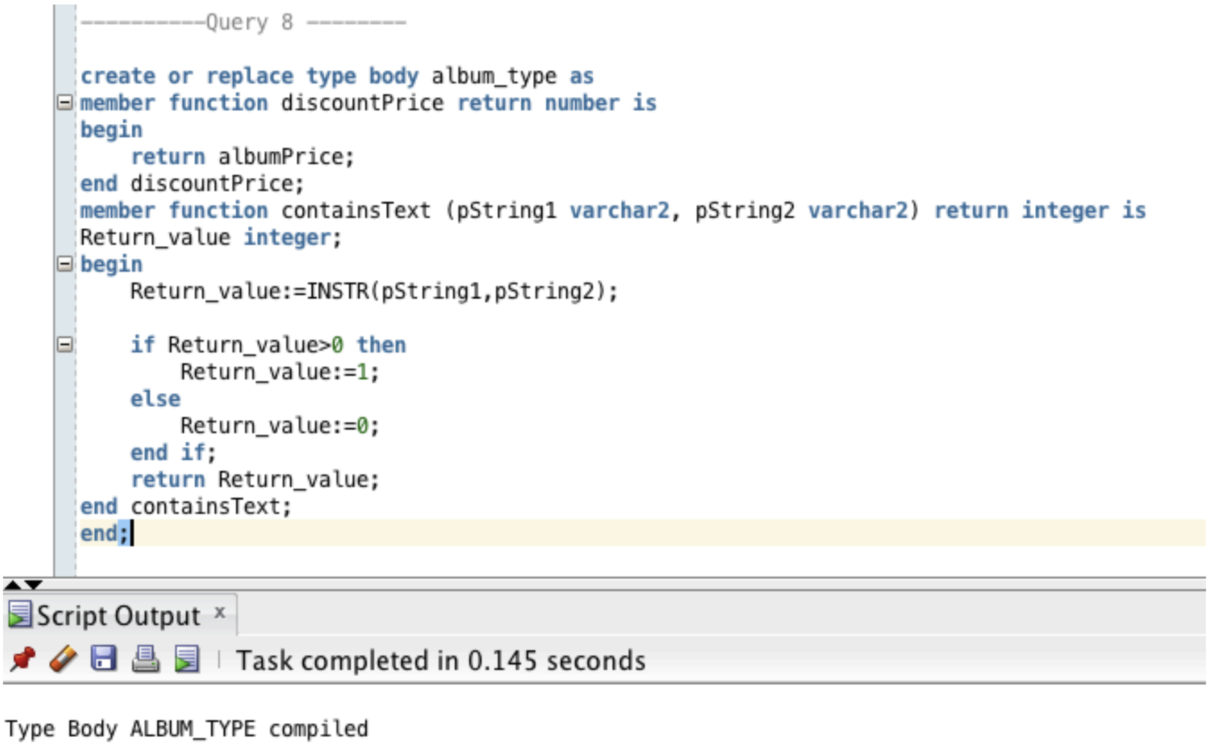
All Rows Fetched: 2 in 0.052 seconds

	ALBUMTITLE	ALBUMPRICE	MEDIATYPE	DISCOUNT	ALBUMUSEDPRICE
1	Kind Of Blue (Legacy Edition)	19.99	Audio CD	3.99	16.99
2	Kind Of Blue (Legacy Edition)	19.99	Vinyl	2.99	16.99

8. Implement the method containsText (pString1, pString2) that returns 1 if pString1 contains pString2, and 0 if it does not. Use this method to find albums with reviews that contain the word 'Great'. Show album title, review text, review score.

Query :

```
create or replace type body album_type as

member function discountPrice return number is

begin

   return albumPrice;

end discountPrice;

member function containsText (pString1 varchar2, pString2 varchar2) return integer is

Return_value integer;

begin

   Return_value:=INSTR(pString1,pString2);

   if Return_value>0 then

      Return_value:=1;

   else

      Return_value:=0;

   end if;

   return Return_value;

end containsText;

end;
```



```
-----------Query 8 ---------

create or replace type body album_type as
member function discountPrice return number is
begin
    return albumPrice;
end discountPrice;
member function containsText (pString1 varchar2, pString2 varchar2) return integer is
Return_value integer;
begin
    Return_value:=INSTR(pString1,pString2);

    if Return_value>0 then
        Return_value:=1;
    else
        Return_value:=0;
    end if;
    return Return_value;
end containsText;
end;
```

```
Type Body ALBUM_TYPE compiled
```

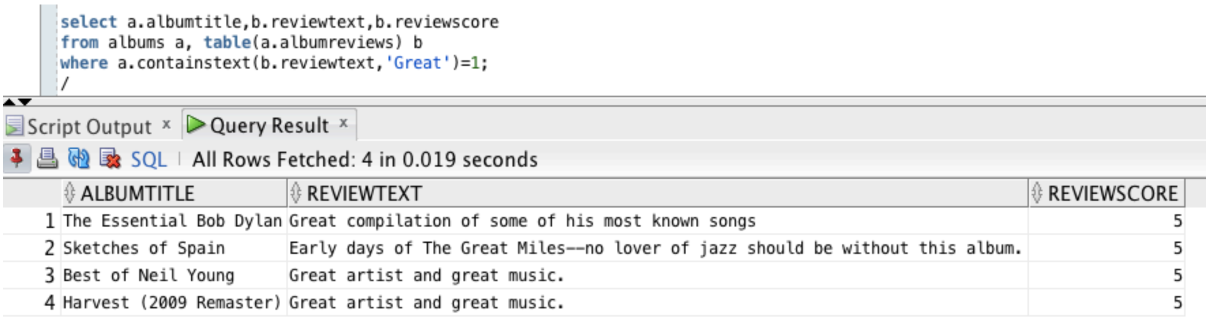
Result : The query to display album title, text, and the review score is

select a.albumtitle,b.reviewtext,b.reviewscore

from albums a, table(a.albumreviews) b

where a.containstext(b.reviewtext,'Great')=1;

/



```
select a.albumtitle,b.reviewtext,b.reviewscore
from albums a, table(a.albumreviews) b
where a.containstext(b.reviewtext,'Great')=1;
/
```

	ALBUMTITLE	REVIEWTEXT	REVIEWSCORE
1	The Essential Bob Dylan	Great compilation of some of his most known songs	5
2	Sketches of Spain	Early days of The Great Miles--no lover of jazz should be without this album.	5
3	Best of Neil Young	Great artist and great music.	5
4	Harvest (2009 Remaster)	Great artist and great music.	5

3.DISCUSSION

The relational model has several advantages and the prime most of them is its flexibility. The Data entered here is being saved in the massive database and a simple query can extract it any time. Moreover the data entered here can be created with separate records . Some of the major advantages of relational database model are Structural independence, Improved conceptual simplicity, Easier to implement, maintain and use , adhoc query capability, and is also a powerful database.

Moreover, the relational model diagrams yields conceptual simplicity, and the representation gives an effective overview about the database. This model provides higher flexibility in adhoc querying and also in case of any new data or records, the data can be added to them very easily. In a similar way the object relational databases are pure relational systems with an extension to the data model with custom datatypes and methods.

Thus some of the advantages of relational design are ,

- **Simplicity :** Comparatively it is much simple and visually commendable.
- **Structural Independence :** The relational models are concerned only with the data and not with any other structural dependencies. Whereas the view depicted here in the object relational databases are dependent to the existing table and so any changes made to the data in the table alters the view . This improves the overall performance of the model
- **Ease of Use :** The relational model is quite easy to understand and interpret as it mostly has rows and columns.
- **Data Independence :** The database structure can be altered without any changes made to the existing application .
- **Scalability :** With respect to number of regards or no of rows/columns, a database should mainly possess way to be enlarged for its usability.

There are other important factors such as performance ,security, Collaborative access, power , support to the new technologies , flexibility , capacity to address all the needs . These advantages and its scalability has provided a great way for the implementation of distributed systems.

4.APPENDIX

OMDB SCRIPT

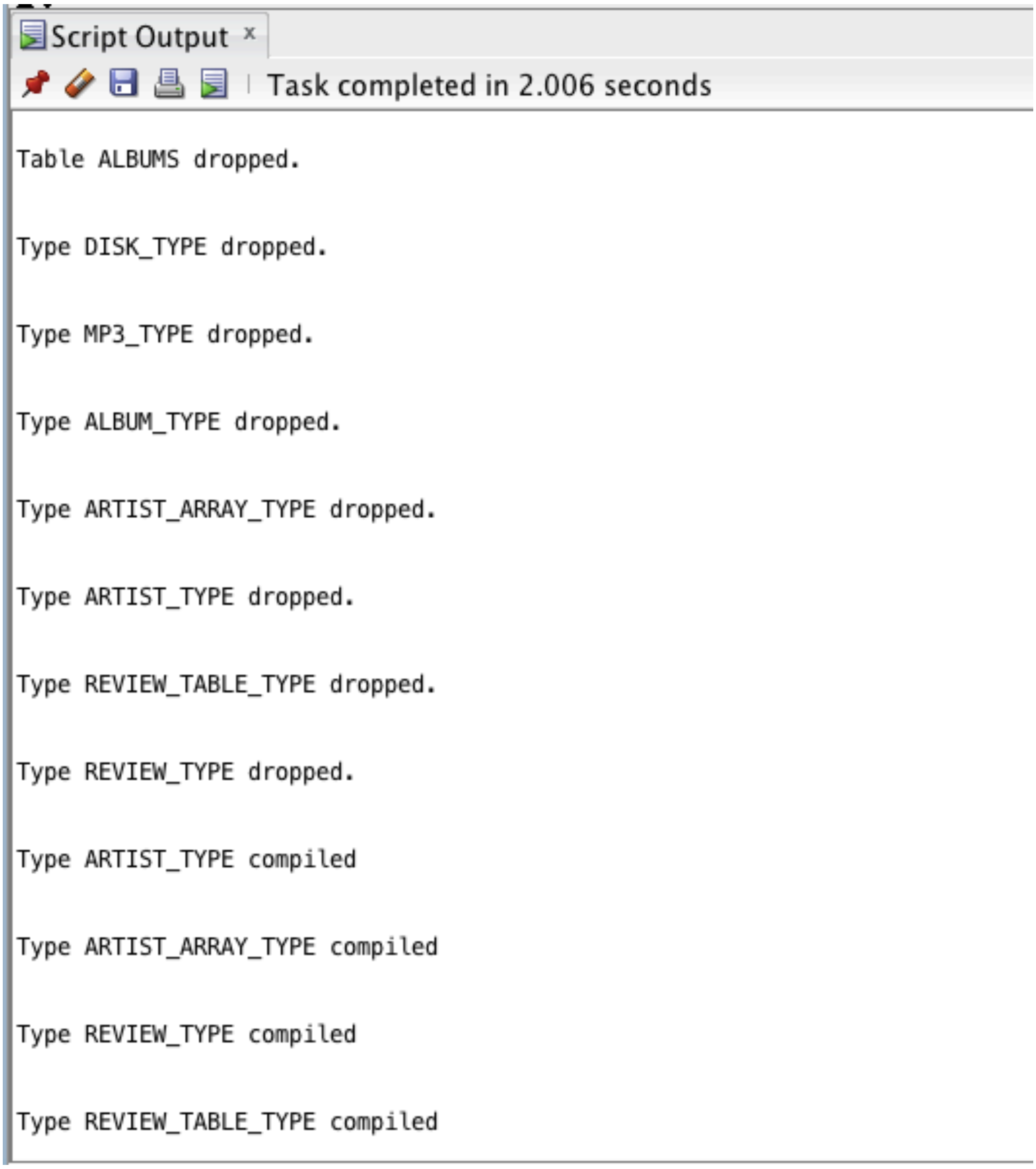
```
-- create OMDB --
-----------------
-- drop tables --
drop table albums force;
/
drop type disk_type force;
/
drop type mp3_type force;
/
drop type album_type force;
/
drop type artist_array_type force;
/
drop type artist_type force;
```

```
/
drop type review_table_type force;
/
drop type review_type force;
/
-- create types --
create or replace type artist_type as object
(artistName varchar(50),
 artistRole varchar(25))
/
create type artist_array_type
as varray(5) of artist_type
/
create or replace type review_type as object
(reviewerName     varchar(25),
 reviewDate       date,
 reviewText       varchar(250),
 reviewScore      number)
/
create or replace type review_table_type as table of review_type
/
create or replace type album_type as object
(albumTitle       varchar(50),
 albumPlaytime          number(3), -- minutes
 albumReleaseDate date,
 albumGenre       varchar(15),
 albumPrice       number(9,2),
 albumTracks      number(2),
 albumArtists           artist_array_type,
 albumReviews           review_table_type,
member function discountPrice return number,
member function containsText (pString1 varchar2, pString2 varchar2) return
integer)
not instantiable not final
/
create or replace type disk_type under album_type
( mediaType       varchar(10),
 diskNum                number(2), -- number of disks
 diskUsedPrice          number(9,2),
 diskDeliveryCost number(9,2),
overriding member function discountPrice return number)
/
create or replace type mp3_type under album_type
(downloadSize     number, -- size in MB
 overriding member function discountPrice return number)
/
-- create tables --
create table albums of album_type
object id system generated
nested table albumReviews store as store_reviews
```

```
/

---Insert Values into the Tabe ---
insert into albums
values (disk_type('The Essential Bob Dylan',99,'8-JUL-2016','Pop',37.00,32,
artist_array_type(
artist_type('Bob Dylan','Composer'),
artist_type('Bob Dylan','Vocals')),
review_table_type(
review_type('Shawn','24-JUL-2018','Wife loved it!',5),
review_type('Reuben','2-AUG-2019','Great compilation of some of his most
known songs',5)),
'Vinyl', 2, null, 11.00));
/

insert into albums
values(disk_type('Sketches of Spain',45,'08-MAR-2011','Jazz',14.99,6,
artist_array_type(
artist_type('Miles Davis','Composer'),
artist_type('Miles Davis','Musician')
),
review_table_type(
review_type('Frederick','16-SEP-2016','Recommend listening while viewing a
sunset.',5),
review_type('Juliet','12-MAR-2018','Early days of The Great Miles--no lover
of jazz should be without this album.',5)
),
'Vinyl',1,16.29,7.00
));
/
--3
insert into albums
values(disk_type('Bob Dylans Greatest Hits',45,'31-JAN-2017','Pop
Rock',29.87,10,
artist_array_type(
artist_type('Bob Dylan','Composer'),
artist_type('Bob Dylan','Vocals')
),
review_table_type(
review_type('Kandy','16-MAR-2015','Early Dylan in all his glory!',5),
review_type('Stewart','18-FEB-2013','Captures Bob Dylan transformation from
a folk song Composer to a rock legend',4)
),
'Vinyl',1,null,11.0
));
/
--4
insert into albums
values(disk_type('Harvest (2009 Remaster)',44,'21-JUN-2009','Rock
Country',28.50,10,
artist_array_type(
artist_type('Neil Young','Composer'),
artist_type('Neil Young','Vocals')
),
review_table_type(
review_type('John','18-FEB-2019','I absolutely LOVE this CD!',5),
review_type('Stewart','18-FEB-2013','Sounds good in vinyl!',5)
),
'Vinyl',1,14.99,11.0
));


/
insert into albums
values (disk_type('Kind Of Blue (Legacy Edition)',155,'20-JAN-
2009','Jazz',19.99,21,
artist_array_type(
artist_type('Miles Davis','Composer'),
artist_type('Miles Davis','Musician')),
review_table_type(
review_type('Laurence','10-SEP-2014','Very very special recording.','5')),
'Vinyl',3,16.99,10.00));
/

insert into albums
values (disk_type('Harvest (2009 Remaster)',44,'21-JUN-2009','Rock
Country',10.50,10,
artist_array_type(
artist_type('Neil Young','Composer'),
artist_type('Neil Young','Vocals')),
review_table_type(
review_type('John','18-FEB-2019','I absolutely LOVE this CD!',5),
review_type('Anthony','16-AUG-2019','Neil Youngs signature album',4)),
'Audio CD',1,4.99,11.00));

/

insert into albums
values (disk_type('The Essential Bob Dylan',99,'8-JUL-2016','Pop',26.17,32,
artist_array_type(
artist_type('Bob Dylan','Composer'),
artist_type('Bob Dylan','Vocals')),
review_table_type(
review_type('Christopher','24-JUN-2016',' This is a terrific album.',   5),
review_type('Cauley','2-AUG-2015','There can only be one Bob Dylan. God
blessed him with the gift of verse.',5)),
'Audio CD',2,null,7.00));

/
```

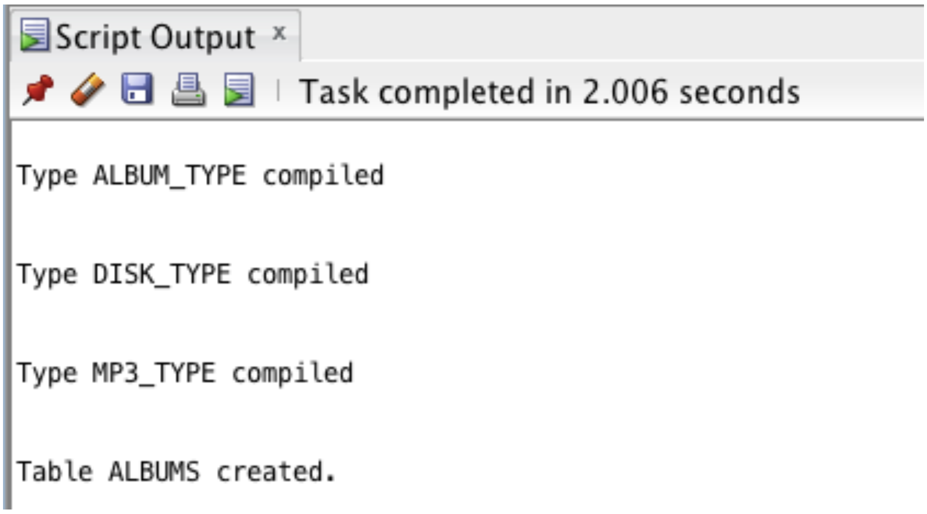
```
insert into albums
values   (disk_type('Bob   Dylans   Greatest   Hits',50,'1-JUN-1999','Pop
Rock',20.81,10,
artist_array_type(
artist_type('Bob Dylan','Composer'),
artist_type('Bob Dylan','Vocals')),
review_table_type(
review_type('Kandy','16-MAR-2015','Early Dylan in all his glory.',5),
review_type('Stewart','18-FEB-2013','Captures Bob Dylan transformation from
a folk song composer to a rock legend.',4)),
'Audio CD',1,null,7.00));
/

insert into albums
values   (disk_type('Kind   Of   Blue   (Legacy   Edition)',155,'20-JAN-
2009','Jazz',19.99,21,
artist_array_type(
artist_type('Miles Davis','Composer'),
artist_type('Miles Davis','Musician')),
review_table_type(
review_type('Amy','17-APR-2018','Poor quality sound compared to the vinyl
record.',2)),
'Audio CD',3,16.99,10.00 ));


/

insert into albums
values (disk_type('Sketches of Spain',45,'20-JAN-2009','Jazz',3.11,6,
artist_array_type(
artist_type('Miles Davis','Composer'),
artist_type('Miles Davis','Musician')),
review_table_type(
review_type('Sara','3-OCT-2016','Another  Must  Have!  One  of  Miles  finest
works.',5),
review_type('Douglas','14-JUN-2014','You might like it, but I admit it seems
like a difficult listen.',5)),
'Audio CD',1,6.41,7.00));


/

insert into albums
values   (disk_type('Gustav   Mahler   Symphony   No.   9',45,'12-OCT-
2017','Classical',23.10,5,
artist_array_type(
artist_type('David Zinman','Conductor'),
artist_type('Gustav Mahler','Composer'),
artist_type('Tonhalle Orchestra','Orchestra')),
review_table_type(
review_type('Lindon','3-DEC-2010','This is an uneventful but fine
recording.',3),
review_type('Prescott','24-AUG-2013','This is truly a spellbinding
record.',5)),
'Audio CD',1,15.20,7.00 ));
/
insert into albums
values (mp3_type('Bob Dylans Greatest Hits',55,'1-JAN-2019','Pop
Rock',5.98,10,
artist_array_type(
artist_type('Bob Dylan','Composer'),
artist_type('Bob Dylan','Vocals')),
review_table_type(
review_type('Mandy','16-MAR-2019','Fantastic music!',5)),60
));
/
insert into albums
values (mp3_type('Best of Neil Young',153,'21-FEB-2019','Pop Rock',17.50,35,
artist_array_type(
artist_type('Neil Young','Composer'),
artist_type('Neil Young','Vocals')),
review_table_type(
review_type('John','16-APR-2019','Great artist and great music.',5)),165
));
/
insert into albums
values (mp3_type('Harvest (2009 Remaster)',44,'21-JUN-2009','Rock
Country',9.49,10,
artist_array_type(
artist_type('Neil Young','Composer'),
artist_type('Neil Young','Vocals')),
review_table_type(
review_type('John','16-APR-2019','Great artist and great music.',5)),52
));
/
insert into albums
values (mp3_type('Sketches of Spain',45,'16-AUG-2013','Jazz',24.99,6,
artist_array_type(
artist_type('Miles Davis','Composer'),
artist_type('Miles Davis','Musician')),
review_table_type(
review_type('Douglas','14-JUN-2014','You might like it but I admit it seems
like a difficult listen.',5)),51
));
/
insert into albums
values (mp3_type('B.B. King Greatest Hits',114,'16-JUL-2013','Rock
Blues',11.49,24,
artist_array_type(
artist_type('B.B. King','Vocals'),
artist_type('B.B. King','Guitar')),
review_table_type(
review_type('David','18-MAY-2015','I highly recommend this album to anyone
who want to see what BB King is all about.',4)),125
));
/
insert into albums
values (mp3_type('The Essential Bob Dylan',99,'8-JUL-2016','Pop',16.00,32,
artist_array_type(
artist_type('Bob Dylan','Composer'),
artist_type('Bob Dylan','Vocals')),
review_table_type(
review_type('Christopher','24-JUN-2016','This is a terrific album.',5),
review_type('Cauley','2-APR-2015','There can only be one Bob Dylan. God
blessed him with the gift of verse',5)),112
));
/
insert into albums
values (mp3_type('Other Peoples Lives',42 ,'15-FEB-2019','Rock
Dance',9.49,10,
artist_array_type(
artist_type('Stats','Composer'),artist_type('Stats','Vocals')),
review_table_type(
review_type('George','17-SEP-2019','Good dancing music.',3)),45
));
```

EXECUTION RESULTS



Task completed in 2.006 seconds

```
Table ALBUMS dropped.


Type DISK_TYPE dropped.


Type MP3_TYPE dropped.


Type ALBUM_TYPE dropped.


Type ARTIST_ARRAY_TYPE dropped.


Type ARTIST_TYPE dropped.


Type REVIEW_TABLE_TYPE dropped.


Type REVIEW_TYPE dropped.


Type ARTIST_TYPE compiled


Type ARTIST_ARRAY_TYPE compiled


Type REVIEW_TYPE compiled


Type REVIEW_TABLE_TYPE compiled
```



Task completed in 2.006 seconds

```
Type ALBUM_TYPE compiled


Type DISK_TYPE compiled


Type MP3_TYPE compiled


Table ALBUMS created.
```