```sql
create database virtual_art_gallery;

use virtual_art_gallery;


-- Create the Artists table

CREATE TABLE Artists (

ArtistID INT PRIMARY KEY,

Name VARCHAR(255) NOT NULL,

Biography TEXT,

Nationality VARCHAR(100));



-- Create the Categories table

CREATE TABLE Categories (

CategoryID INT PRIMARY KEY,

Name VARCHAR(100) NOT NULL);



-- Create the Artworks table

CREATE TABLE Artworks (

ArtworkID INT PRIMARY KEY,

Title VARCHAR(255) NOT NULL,

ArtistID INT,

CategoryID INT,

Year INT,

Description TEXT,

ImageURL VARCHAR(255),

FOREIGN KEY (ArtistID) REFERENCES Artists (ArtistID),

FOREIGN KEY (CategoryID) REFERENCES Categories (CategoryID));



-- Create the Exhibitions table

CREATE TABLE Exhibitions (
```

```sql
ExhibitionID INT PRIMARY KEY,

Title VARCHAR(255) NOT NULL,

StartDate DATE,

EndDate DATE,

Description TEXT);


-- Create a table to associate artworks with exhibitions

CREATE TABLE ExhibitionArtworks (

ExhibitionID INT,

ArtworkID INT,

PRIMARY KEY (ExhibitionID, ArtworkID),

FOREIGN KEY (ExhibitionID) REFERENCES Exhibitions (ExhibitionID),

FOREIGN KEY (ArtworkID) REFERENCES Artworks (ArtworkID));



-- Insert sample data into the Artists table

INSERT INTO Artists (ArtistID, Name, Biography, Nationality) VALUES

(1, 'Pablo Picasso', 'Renowned Spanish painter and sculptor.', 'Spanish'),

(2, 'Vincent van Gogh', 'Dutch post-impressionist painter.', 'Dutch'),

(3, 'Leonardo da Vinci', 'Italian polymath of the Renaissance.', 'Italian');



-- Insert sample data into the Categories table

INSERT INTO Categories (CategoryID, Name) VALUES

(1, 'Painting'),

(2, 'Sculpture'),

(3, 'Photography');



-- Insert sample data into the Artworks table

INSERT INTO Artworks (ArtworkID, Title, ArtistID, CategoryID, Year, Description, ImageURL) VALUES
```

```sql
(1, 'Starry Night', 2, 1, 1889, 'A famous painting by Vincent van Gogh.', 'starry_night.jpg'),

(2, 'Mona Lisa', 3, 1, 1503, 'The iconic portrait by Leonardo da Vinci.', 'mona_lisa.jpg'),

(3, 'Guernica', 1, 1, 1937, 'Pablo Picasso\'s powerful anti-war mural.', 'guernica.jpg');


-- Insert sample data into the Exhibitions table


INSERT INTO Exhibitions (ExhibitionID, Title, StartDate, EndDate, Description) VALUES

(1, 'Modern Art Masterpieces', '2023-01-01', '2023-03-01', 'A collection of modern art masterpieces.'),

(2, 'Renaissance Art', '2023-04-01', '2023-06-01', 'A showcase of Renaissance art treasures.');


--  Insert artworks into exhibitions
INSERT INTO ExhibitionArtworks (ExhibitionID, ArtworkID) VALUES

(1, 1),

(1, 2),

(1, 3),

(2, 2);


/*
1.Retrieve the names of all artists along with the number of artworks they have in the gallery, and

list them in descending order of the number of artworks.

*/
/*
projection : artist

criteria artworks

*/
select a.name, count(art.artworkid) as number_of_artworks

from artists a JOIN artworks art

ON a.artistid = art.artistid
```

```
group by a.name

order by number_of_artworks desc;



/*



Pablo Picasso    1

Vincent van Gogh        1

Leonardo da Vinci       1

*/
```

-- 2. List the titles of artworks created by artists from 'Spanish' and 'Dutch' nationalities, and order them by the year in ascending order.

```
/*

projection : artworks

criteria : artists

*/



select art.title

from artists a join artworks art

ON a.artistid = art.artistid

where a.nationality IN ('spanish','Dutch')

order by year asc ;



/*

Starry Night

Guernica

*/
```

-- 3. Find the names of all artists who have artworks in the 'Painting' category, and the number of artworks they have in this category.

```
/*
projection : artist

criteria : artworks

*/


select a.name, count(*) as number_of_artworks

from artists a join artworks art

ON a.artistid = art.artistid

join categories c

ON c.categoryid = art.categoryid

where c.name= 'painting'

group by a.name;


/*

Pablo Picasso     1

Vincent van Gogh          1

Leonardo da Vinci         1

*/
```

-- 4. List the names of artworks from the 'Modern Art Masterpieces' exhibition, along with their artists and categories

```
/* projection : artworks,artists,categories

 criteria : exhibition

 */


 select art.title, a.name, c.name

 from artists a

 JOIN artworks art

 ON a.artistid = art.artistid
```

```sql
   JOIN categories c

   ON c.categoryid = art.categoryid

   join exhibitionartworks ea

   ON art.artworkID = ea.artworkID

   join exhibitions e

   ON ea.exhibitionid = e.exhibitionid

   where e.title = 'Modern Art Masterpieces';


   /*

   Starry Night    Vincent van Gogh          Painting

   Mona Lisa       Leonardo da Vinci         Painting

   Guernica        Pablo Picasso    Painting

   */
```

-- 5. Find the artists who have more than two artworks in the gallery.

```sql
select a.name, count(*) as number_of_artwork

from artists a JOIN artworks art ON a.artistid = art.artistid

group by a.name

having number_of_artwork>2;
```

-- 6. Find the titles of artworks that were exhibited in both 'Modern Art Masterpieces' and 'Renaissance Art' exhibitions

```sql
select art.title

from artworks art join exhibitionartworks ea ON art.artworkid = ea.artworkid

JOIN exhibitions e ON ea.exhibitionid = e.exhibitionid

WHERE e.title IN ('Modern Art Masterpieces','Renaissance Art' )

GROUP BY art.Title
```

```sql
HAVING COUNT(DISTINCT e.title) = 2;
```

-- Mona Lisa

-- 7. Find the total number of artworks in each category

```sql
select art.title, count(*) as number_of_artworks
from artworks art join categories c ON c.categoryid = art.categoryid
group by art.title;
```

```
/*
Starry Night    1
Mona Lisa       1
Guernica        1
*/
```

-- 8. List artists who have more than 3 artworks in the gallery.

```sql
select a.name,count(*)
from artists a join artworks art ON a.artistid = art.artistid
group by a.artistid
having count(*) >3;
```

-- 9. Find the artworks created by artists from a specific nationality (e.g., Spanish).

```sql
select a.name, art.title, a.nationality
from artists a JOIN artworks art ON a.artistid = art.artistid
where nationality = 'spanish';
```

-- Pablo Picasso Guernica   Spanish

-- 10. List exhibitions that feature artwork by both Vincent van Gogh and Leonardo da Vinci.

```sql
select *
from  artists a JOIN artworks art ON a.artistid = art.artistid
 join exhibitionartworks ea ON art.artworkid = ea.artworkid
join exhibitions e ON ea.exhibitionid = e.exhibitionid
where a.name IN ('Vincent van Gogh','Leonardo da Vinci');
```

```
/*
3       Leonardo da Vinci      Italian polymath of the Renaissance.     Italian  2       Mona Lisa
        3       1       1503    The iconic portrait by Leonardo da Vinci.       mona_lisa.jpg   1
        2       1       Modern Art Masterpieces       2023-01-01      2023-03-01      A collection
of modern art masterpieces.

2       Vincent van Gogh       Dutch post-impressionist painter.        Dutch  1       Starry Night
        2       1       1889    A famous painting by Vincent van Gogh. starry_night.jpg 1       1
        1       Modern Art Masterpieces      2023-01-01      2023-03-01      A collection of
modern art masterpieces.

3       Leonardo da Vinci      Italian polymath of the Renaissance.     Italian  2       Mona Lisa
        3       1       1503    The iconic portrait by Leonardo da Vinci.       mona_lisa.jpg   2
        2       2       Renaissance Art 2023-04-01      2023-06-01      A showcase of Renaissance
art treasures.
*/
```

-- 11. Find all the artworks that have not been included in any exhibition.

```sql
select *
from artworks
where artworkid NOT IN(select art.artworkid
from artworks art join exhibitionartworks ea ON  art.artworkid = ea.artworkid
JOIN exhibitions e ON ea.exhibitionid = e.exhibitionid)
;
```

-- 12. List artists who have created artworks in all available categories.

```sql
select a.name from artists a

join artworks art on a.artistID=art.artistID

join categories c on c.categoryID=art.categoryID

group by a.name

having count(distinct c.categoryid)=(select count(*) from categories );
```

-- 13. List the total number of artworks in each category.

```sql
select c.name, count(*)

from artworks art JOIN categories c ON c.categoryid = art.categoryid

group by c.name;
```

```
/*
Painting         3
*/
```

-- 14. Find the artists who have more than 2 artworks in the gallery.

```sql
select a.name, count(*)

from artists a JOIN artworks art

ON a.artistid = art.artistid

group by a.name

having count(*)>2;
```

-- 15. List the categories with the average year of artworks they contain, only for categories with more than 1 artwork.

```sql
select c.name , avg(art.year)

from artworks art JOIN categories c

ON c.categoryid = art.categoryid
```

group by c.name

having count(art.artworkid)>1;

-- Painting   1776.3333

-- 16. Find the artworks that were exhibited in the 'Modern Art Masterpieces' exhibition.

select art.title

from artworks art join exhibitionartworks ea ON art.artworkid = ea.artworkid

JOIN exhibitions e ON ea.exhibitionid = e.exhibitionid

where e.title = 'Modern art masterpieces';

/*

Starry Night

Mona Lisa

Guernica

*/

-- 17. Find the categories where the average year of artworks is greater than the average year of all artworks.

select c.name

from artworks art JOIN categories c

ON c.categoryid = art.categoryid

group by c.name

having AVG(art.year) > (select AVG(year) from artworks);

-- 18. List the artworks that were not exhibited in any exhibition.

```sql
select *
from artworks art Left JOIN exhibitionartworks ea
ON art.artworkid = ea.artworkid
where ea.exhibitionid is NUll;
```

-- 19. Show artists who have artworks in the same category as "Mona Lisa."

```sql
select a.name, art.title
from artists a JOIN artworks art
ON a.artistid = art.artistid
where art.title = 'mona lisa';
```

```
/*
Leonardo da Vinci        Mona Lisa
*/
```

-- 20. List the names of artists and the number of artworks they have in the gallery.

```sql
select a.name, count(art.artworkid) as no_of_artworks
from artists a JOIN artworks art
ON a.artistid = art.artistid
group by a.name;
```

```
/*
Pablo Picasso    1
Vincent van Gogh        1
Leonardo da Vinci       1
*/
```