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1)
SELECT *
FROM album
WHERE album_startRecDate >= ? AND album_finishRecDate <= ?;

$\pi^*(\sigma_{\text{album_startRecDate} \geq ? \text{ AND } \text{album_finishRecDate} \leq ?}(\text{album}))$

2)
SELECT *
FROM song
 INNER JOIN album ON song.album_id = album.album_id
 INNER JOIN musician ON album.musician_id = musician.musician_id
WHERE song.song_date >= ? AND song.song_date <= ? AND musician.musician_name LIKE ?;

$\pi^*(\sigma_{\text{song_date} \geq ? \text{ AND } \text{song_date} \leq ?}(\text{song}) \text{ AND } \sigma_{\text{musician_name Like ?}(\text{musician})}) \bowtie \text{album}) \bowtie \text{musician})$

3)
SELECT DISTINCT album.album_name
FROM song, album
 INNER JOIN musician ON album.musician_id = musician.musician_id
WHERE song.song_date >= ? AND song.song_date <= ? AND musician.musician_name LIKE ?;

$\pi_{\text{album_name}}(\sigma_{\text{song_date} \geq ? \text{ AND } \text{song_date} \leq ?}(\text{song}) \text{ AND } \sigma_{\text{musician_name Like ?}(\text{musician})}) \bowtie \text{musician}) \bowtie \text{album})$

4)
SELECT instrument.instrument_name, COUNT(*) as count
FROM song INNER JOIN instrument ON song.instrument_id = instrument.instrument_id
GROUP BY instrument_name
ORDER BY count DESC LIMIT 1;

$\pi_{\text{instrument_name, count}}(\sigma_{\text{instrument_name} = ?}(\text{instrument}) \text{) } \text{song} \bowtie 1)$

5)
SELECT DISTINCT instrument.instrument_name
FROM album INNER JOIN song ON album.album_id = song.album_id
 INNER JOIN instrument ON song.instrument_id = instrument.instrument_id
WHERE album.album_name = ? ;

$\pi_{\text{instrument_name}}(\sigma_{\text{album_name} = ?}(\text{album})) \bowtie \text{song}) \bowtie \text{instrument})$

6)
SELECT musician.musician_name, COUNT(*) AS count
FROM musician
 INNER JOIN album ON musician.musician_id = album.musician_id
WHERE album_startRecDate >= ? AND album_finishRecDate <= ?
GROUP BY musician.musician_name
ORDER BY count DESC LIMIT 1;

$\pi_{\text{musician_name, count}}(\sigma_{\text{startRecDate} \geq ? \text{ AND } \text{album_finishRecDate} \leq ?}(\text{album})) \bowtie \text{musician})$

7)
 SELECT manufacturer.manufacturer_name, COUNT(*) AS count
 FROM instrument
 INNER JOIN manufacturer ON instrument.manufacturer_id = manufacturer.manufacturer_id
 INNER JOIN song ON song.instrument_id = instrument.instrument_id
 GROUP BY manufacturer.manufacturer_name
 ORDER BY count DESC LIMIT 1;

π manufacturer_name, count (σ startRecDate >= ? AND album_finishRecDate <= ? (manufacturer) \bowtie song)

8)
 SELECT SUM(song.song_time) / 60 as time FROM song;

π song_time(song)/60

9)
 SELECT musician.musician_name, COUNT(*) AS count
 FROM song_with
 INNER JOIN musician ON song_with.musician_id = musician.musician_id
 GROUP BY musician.musician_name
 ORDER BY count DESC LIMIT 1;

π musician_name, count (σ * (song_with) \bowtie musician)

10)
 SELECT genre.genre_name, COUNT(*) AS count
 FROM song
 INNER JOIN genre ON song.genre_id = genre.genre_id
 GROUP BY genre.genre_name
 ORDER BY count DESC LIMIT 1"

π musician_name, count (σ * (song_with) \bowtie musician)

11)
 SELECT musician.musician_name, COUNT(song.song_tech_id) AS count
 FROM musician
 INNER JOIN song ON musician.musician_id = song.song_tech_id
 WHERE song.song_date >= ? AND song.song_date <= ?
 GROUP BY musician.musician_name
 ORDER BY count DESC

π musician_name, count (σ song_date >= ? AND song_date <= ? (song) \bowtie musician) \bowtie song)^musician_name

12)
 SELECT album.album_name, album.album_finishRecDate
 FROM album
 ORDER BY album.album_finishRecDate LIMIT 1;

π album_name, π album_finishRecDate(σ * (album)^1

13)
 SELECT song.song_id, song.song_name
 FROM song
 WHERE song.song_id = song.song_id AND song.album_id != song.album_id;

$\pi_{\text{song_id}, \text{song_name}} (\sigma_{\text{song_id} = \text{song_id} \ \& \ \text{album_id} \neq \text{album_id}}(\text{song}))$

14)
 SELECT musician.musician_name
 FROM musician
 INNER JOIN song ON musician.musician_id = song.song_tech_id
 INNER JOIN album ON album.album_id = song.album_id

$\pi_{\text{musician_name}} ((\sigma^* (\text{musician}) \bowtie \text{song}) \bowtie \text{album})$

15)
 SELECT musician.musician_name, COUNT(musician.musician_name) AS count
 FROM genre
 INNER JOIN song ON genre.genre_id = song.genre_id
 INNER JOIN album ON song.album_id = album.album_id
 INNER JOIN musician ON album.musician_id = musician.musician_id
 GROUP BY musician.musician_name ORDER BY count DESC;

$\pi_{\text{musician_name}, \text{count}} (\sigma^* (\text{song_with}) \bowtie \text{musician})$

BEFORE:

musician							
id	name	type (Plays/Sings)	address_id	phone number	plays	manufacturer	
	1 Netsky	play	Belgium	99912345678	Piano	Yamaha	
	2 Sia	sign	Usa	98976975975	Piano	Yamaha	
	3 Dardust	composite	Ireland	9897877787	Piano	Yamaha	
	4 Chopen	techRecorder	Poland	42065654665	Guitar	Yamaha	
	5 Pendulum	play	Austria	9868677654	Guitar	Yamaha	
	6 Fox Stevenson	sign	Czech	9647756864	Guitar	Yamaha	
	7 Mozart	composite	Canada	975975975957	Guitar	Yamaha	
	8 Wan Lolen	techRecorder	Israel	32132132131	Guitar	JVC	
album							
id	name	startRecordDate	finishRecordDate	numofSongs	includes_id		
	1 Album1	2016	2016	22 Vocal			
	2 Album2	2016	2016	22 Vocal			
	3 Album3	2016	2016	22 Song			
	4 Album4	2016	2016	22 Song			
songs							
id	coauthor	name	lyricsAuthor	songTime(secs)	genre	recordDate	techRecorder
	1 Sia	Song1	Fox Stevenson	111	Rock	%date%	Netsky
	2 Sia	Song2	Fox Stevenson	111	Rock	%date%	Netsky
	3 Mozart	Song3	Fox Stevenson	111	Rock	%date%	Netsky
	4 Mozart	Song4	Dardust	222	Pop	%date%	Wan Lolen
	5 Chopen	Song5	Fox Stevenson	222	Pop	%date%	Wan Lolen

musician_id INT(11)	country_id INT(11)	musician_phone VARCHAR(45)	country_id INT(11)	country_name VARCHAR(45)
1	3	123456868	10	Austria
2	3	232352355	4	Belgium
3	3	523463463	6	China
4	2	112351255	3	Irlands
5	2	112351255	5	Israel
6	2	234623461	9	Italy
7	1	136136136	7	North Korea
8	1	236236236	8	Russia
9	1	124124124	2	UK
10	6	322352351	1	USA

album_id INT(11)	album_name VARCHAR(45)	album_startRecDate DATE	album_finishRecDate DATE	album_songsNum INT(11)	musician_id INT(11)
1	Netsky	10/5/2009	1/6/2010	14	1
2	2	4/5/2011	6/25/2012	15	1
3	3	1/1/2013	6/3/2016	12	1
4	Immersion	3/1/2008	5/21/2010	15	5
5	The Reworks	1/1/2000	6/29/2018	13	5
6	In Silico	5/5/2007	5/12/2008	10	5
7	Hold Your Colour	2/2/2003	7/25/2005	14	5
8	Endless	5/5/2013	6/6/2013	1	6
9	No Fox Given	6/5/2016	5/1/2016	1	6
10	Go Like	5/5/2019	5/5/2016	1	6

genre_id INT(11)	genre_name VARCHAR(45)	instrument_id INT(11)	instrument_name VARCHAR(45)	manufacturer_id INT(11)
10	Ambient	1	Piano	1
1	Bass	2	Guitar	1
8	Blues	3	Bass Guitar	1
5	Classic	4	Drums	1
4	Electronic	5	Violin	1
9	Hip-hop	6	Mixer	2
6	Jazz	7	Saxophone	3
7	Metal	8	Cello	4
3	Pop	9	Trumpet	5
2	Rock	10	Vocal	1

manufacturer_id INT(11)	manufacturer_name VARCHAR(45)	musician_id INT(11)	musician_name VARCHAR(45)	musician_address_id VARCHAR(45)
1	Yamaha	1	Netsky	10
2	Sony	2	Sia	9
3	Philips	3	Dardust	8
4	JVC	4	Chopen	7
5	Sanyo	5	Pendulum	6
6	Gibson	6	Fox Stevenson	5
7	Seagull	7	Mozart	4
8	Martin	8	Wan Lolen	3
9	Taylor	9	Madeon	2
10	Ovation	10	Queen	1

song_id INT(11)	song_name VARCHAR(45)	song_time INT(11)	genre_id INT(11)	song_date DATE	album_id INT(11)	song_type_id INT(11)	instrument_id VARCHAR(45)	song_tech_id VARCHAR(45)
1	Escape	358	4	5/31/2010	1	1	1	8
2	Iron Heart	356	4	5/31/2010	1	1	2	8
3	Moving with You	315	4	5/31/2010	1	1	3	8
4	Secret Agent	335	1	5/31/2010	1	1	1	8
5	Crush	253	1	5/31/2010	4	5	1	8
6	Blood Sugar	215	1	5/1/2018	5	5	1	8
7	Prelude	52	1	1/1/2007	7	4	4	8
8	Out Here	512	7	2/2/2007	7	8	2	8
9	Tarantula	351	6	2/2/2007	7	3	5	9
10	Still Grey	655	3	2/2/2007	7	2	10	9

song_type_id INT(11)	song_type_name VARCHAR(45)
1	Electronic
2	Vocal
3	Instrumental
4	Opera
5	Bass
6	MSRM
7	Beat
8	Drums
9	Piano
10	Horn

song_id INT(11)	musician_id INT(11)
6	1
6	2
6	3
6	4
1	5
2	5
1	6
2	6
1	7

