

### Exercise 3: Problem Scenario

Notown Records has decided to store information about musicians who perform on its albums. Each musician that records at Notown has an SSN, a name, an address, and a phone number. No musician has more than one phone. Each instrument used in songs recorded at Notown has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat). Each album recorded on the Notown label has a unique identification number, a title, a copyright date and a format (e.g., CD or MC). Each song recorded at Notown has a title and an author. Each musician may play several instruments; and a given instrument may be played by several musicians. Each album has a number of songs on it, but no song may appear on more than one album. Each song is performed by one or more musicians, and a musician may perform a number of songs. Each album has exactly one musician who acts as its producer. A musician may produce several albums.

#### Insertion queries:

##### **instruments:**

```
db.instrument.insertMany([
{
  iuin: 1,
  name: 'guitar',
  key: 'A'
},
{
  iuin: 3,
  name: 'piano',
  key: 'D'
},
{
  iuin: 8,
  name: 'flute',
  key: 'C'
},
{
  iuin: 4,
  name: 'violin',key: 'D'
}
```

])

**Songs:**

```
db.songs.insertMany([
{
  sid: 'S1',
  stitle: 'Title 1',
  author: [ 'Amith', 'Bharath' ]
},
{
  sid: 'S2',
  stitle: 'Title 2',
  author: [ 'Kiran' ]
},
{
  sid: 'S3',
  stitle: 'Title 3',
  author: [ 'Kumar' ]
},
{
  sid: 'S4',
  stitle: 'Title 4',
  author: [ 'Amith' ]
},
{
  sid: 'S5',
  stitle: 'Title 5',
  author: [ 'Kiran' ]
},
{
  sid: 'S6',
  stitle: 'Title 6',
  author: [ 'Linda' ]
},
{
  sid: 'S7',
  stitle: 'Title 7',
  author: [ 'Bharath' ]
}
])
```

**musician:**

```
db.musician.insertMany([
```

```
{  
  ssn: 'M1',  
  name: 'Amith',  
  address: 'Bangalore',  
  phone: 8745214523,  
  iuin: [ 1, 3, 8 ],  
  sid: [ 'S4', 'S5' ]  
},
```

```
{  
  ssn: 'M2',  
  name: 'Bharath',  
  address: 'Bangalore',  
  phone: 9874532145,  
  iuin: [ 3, 8 ],  
  sid: [ 'S1', 'S2' ]  
},
```

```
{  
  ssn: 'M3',  
  name: 'Kiran',  
  address: 'Mysore',  
  phone: 8745632145,  
  iuin: [ 1 ],  
  sid: [ 'S1', 'S2' ]  
},
```

```
{  
  ssn: 'M4',  
  name: 'Kumar',  
  address: 'Tumkur',  
  phone: 9874521456,  
  iuin: [ 1, 3, 4, 8 ],  
  sid: [ 'S1', 'S2', 'S4' ]  
},
```

```
{  
  ssn: 'M5',  
  name: 'Linda',  
  address: 'New York',  
  phone: 1234567890,  
  iuin: [ 1, 4 ],  
  sid: [ 'S5', 'S4' ]  
},
```

```
{ssn: 'M6',  
  name: 'David',
```

```
address: 'Los Angeles',  
phone: 9876543210,  
iuid: [ 8 ],  
sid: [ 'S1', 'S6' ]  
}  
])
```

**album:**

```
db.album.insertMany([  
{  
  auin: 'A1',  
  title: 'Album 1',  
  date: '2001-5-23',  
  format: 'CD',  
  sid: [ 'S1', 'S2', 'S5' ],  
  producer: 'Kumar'  
},  
{  
  auin: 'A2',  
  title: 'Album 2',  
  date: '2010-9-13',  
  format: 'MC',  
  sid: [ 'S3', 'S4' ],  
  producer: 'Amith'  
},  
{  
  auin: 'A3',  
  title: 'Album 3',  
  date: '2015-12-10',  
  format: 'CD',  
  sid: [ 'S6', 'S7' ],  
  producer: 'Bharath'}  
])
```

**1. List musician name, title of the song which he has played, the album in which song has occurred.**

```
db.musician.aggregate([
  // Unwind the sid array to have one document per song a musician has played
  { $unwind: "$sid" },

  // Lookup to join with the songs collection
  { $lookup: {
    from: "songs",
    localField: "sid",
    foreignField: "sid",
    as: "songDetails"
  }
},
  // Unwind the songDetails array to have one document per song
  { $unwind: "$songDetails" },

  // Lookup to join with the album collection
  { $lookup: {
    from: "album",
    localField: "sid",
    foreignField: "sid",
    as: "albumDetails"
  }
},
  // Unwind the albumDetails array to have one document per album
  { $unwind: "$albumDetails" },

  // Group by musician name, song title, and album title
  { $group: {
    _id: {
      musicianName: "$name",
      songTitle: "$songDetails.stitle",
      albumTitle: "$albumDetails.title"
    }
  }
},

  // Project the fields to include in the final output
  { $project: {
    _id: 0,
    musicianName: "$_id.musicianName",
    songTitle: "$_id.songTitle",
```

```
        albumTitle: "$_id.albumTitle"
    }
}
])
```

### Output:

```
[
  {
    musicianName: 'Kiran',
    songTitle: 'Title 1',
    albumTitle: 'Album 1'
  },
  {
    musicianName: 'Amith',
    songTitle: 'Title 5',
    albumTitle: 'Album 1'
  },
  {
    musicianName: 'Kumar',
    songTitle: 'Title 1',
    albumTitle: 'Album 1'
  },
  {
    musicianName: 'Linda',
    songTitle: 'Title 4',
    albumTitle: 'Album 2'
  },
  {
    musicianName: 'David',
    songTitle: 'Title 1',
    albumTitle: 'Album 1'
  },
  {
    musicianName: 'Amith',
    songTitle: 'Title 4',
    albumTitle: 'Album 2'
  },
  {
    musicianName: 'David',
    songTitle: 'Title 6',
    albumTitle: 'Album 3'
  }
]
```

```

},
{
  musicianName: 'Bharath',
  songTitle: 'Title 1',
  albumTitle: 'Album 1'
},
{
  musicianName: 'Kumar',
  songTitle: 'Title 2',
  albumTitle: 'Album 1'
},
{
  musicianName: 'Linda',
  songTitle: 'Title 5',
  albumTitle: 'Album 1'
},
{
  musicianName: 'Kiran',
  songTitle: 'Title 2',
  albumTitle: 'Album 1'
},
{
  musicianName: 'Bharath',
  songTitle: 'Title 2',
  albumTitle: 'Album 1'
},
{
  musicianName: 'Kumar',
  songTitle: 'Title 4',
  albumTitle: 'Album 2'
}
]

```

## 2. Retrieve the name of Musician who have not produced any Album

```

db.musician.aggregate([
  {
    $lookup: {
      from: "album",
      localField: "name",
      foreignField: "producer",
      as: "producedAlbums"
    }
  }
])

```

```

    },
    {
      $match: {
        "producedAlbums.0": { $exists: false }
      }
    },
    {
      $project: {
        _id: 0,
        name: 1
      }
    }
  ]
})

```

### OUTPUT:

```
[ { name: 'Kiran' }, { name: 'Linda' }, { name: 'David' } ]
```

### 3. List the details of songs which are performed by more than 3 musicians.

```

db.musician.aggregate([
  // Unwind the sid array to have one document per song a musician has performed
  { $unwind: "$sid" },

  // Group by song ID and count the number of musicians for each song
  { $group: {
    _id: "$sid",
    musicianCount: { $sum: 1 }
  } },

  // Match songs that are performed by more than 3 musicians
  { $match: {
    musicianCount: { $gt: 3 }
  } },

  // Lookup to get the song details from the songs collection
  { $lookup: {
    from: "songs",
    localField: "_id",
    foreignField: "sid",
    as: "songDetails"
  } }
])

```



```

    }
  },

  // Unwind the songDetails array to get a flat structure
  { $unwind: "$songDetails" },

  // Project the desired fields from the songDetails
  { $project: {
    _id: 0,
    sid: "$songDetails.sid",
    stitle: "$songDetails.stitle",
    author: "$songDetails.author",
    musicianCount: 1
  }
}
])

```

#### **Output:**

```

[
  {
    musicianCount: 4,
    sid: 'S1',
    stitle: 'Title 1',
    author: [ 'Amith', 'Bharath' ]
  }
]

```

- 4. List the different instruments played by the musicians and the average number of musicians who play the instrument.**

```

db.instrument.aggregate([
{
  "$lookup": {
    "from": "musician",
    "localField": "iuin",
    "foreignField": "iuin",
    "as": "musicians"
  }
}
])

```

```

}
},
{
"$project": {
"_id": 0,
"instrument_name": "$name",
"num_musicians": {
"$size": "$musicians"
}
}
},
{
"$group": {
"_id": "$instrument_name",
"average_musicians": {
"$avg": "$num_musicians"
}
}
}
])

```

### Output:

```

[
  { _id: 'guitar', average_musicians: 4 },
  { _id: 'flute', average_musicians: 4 },
  { _id: 'violin', average_musicians: 2 },
  { _id: 'piano', average_musicians: 3 }
]

```

5. Retrieve album title produced by the producer who plays guitar as well as flute and has produced no songs greater than the average songs produced by all producers.

```

db.album.aggregate([
{
  $lookup: {
    from: "musician",
    localField: "producer",
    foreignField: "name",
    as: "musicians"
  }
}
])

```

```

},{
$match: {
"musicians.iuin": {
$all: [1, 8]
}
}
},
{
$project: {
_id: 0,
title: 1
}
}
]);

```

### Output:

```
[ { title: 'Album 1' }, { title: 'Album 2' } ]
```

## 6. List the details of musicians who can play all the instruments present.

```

db.musician.find({
  "iuin": {
    "$all": db.instrument.distinct("iuin")
  }
}, {"_id": 0})

```

### OutPut:

```

[
  {
    ssn: 'M4',
    name: 'Kumar',
    address: 'Tumkur',
    phone: 9874521456,
    iuin: [ 1, 3, 4, 8 ],
    sid: [ 'S1', 'S2', 'S4' ]
  }
]

```

