Introduction to Analytics

LocalTek Healthcare Analytics

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What is a Relational Database?

- Relational databases store related data in **tabular form**
- Relationships between tables are defined with **keys** (primary and foreign)
- Most relational databases are created for use by applications and optimized for **CRUD *transactions***
  - Create
  - Read
  - Update
  - Delete
- Data Analysts/Data Scientists mostly focused on **Read** - querying the data. They want to look at the data and perform calculations without making any permanent changes.

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What is SQL

SQL stands **S**tructured **Q**uery **L**anguage. It is the language you use to interact with a database. It allows you to write out what you want to search for, goes to a database that you specify, then returns those results to you.

The Structured part of SQL means queries are written in a specific format using specific keywords.

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Keywords

- **SELECT**
- **FROM**
- AS
- **LIMIT**
- DISTINCT
- **COUNT**
- **WHERE**
- AND
- OR
- BETWEEN
- IN
- (NOT) NULL
- LIKE
- **AVG(), SUM(), MAX(), MIN(), etc.**
- **ORDER BY**
- **GROUP BY**
- HAVING

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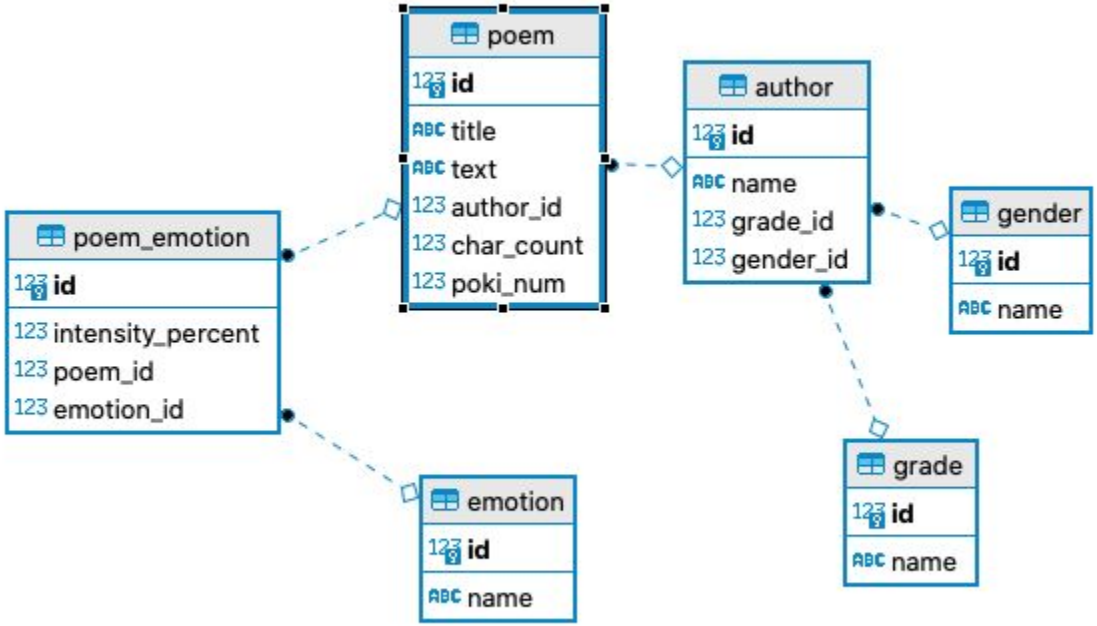
For our learning examples, we will be using the PoetryKids database. Below is an Entity Relationship Diagram (ERD) that shows the tables in the database and the relationships between tables.



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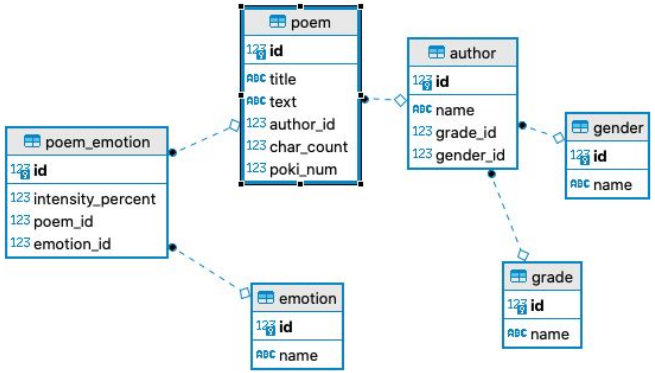
Format of a Query

Keywords all caps

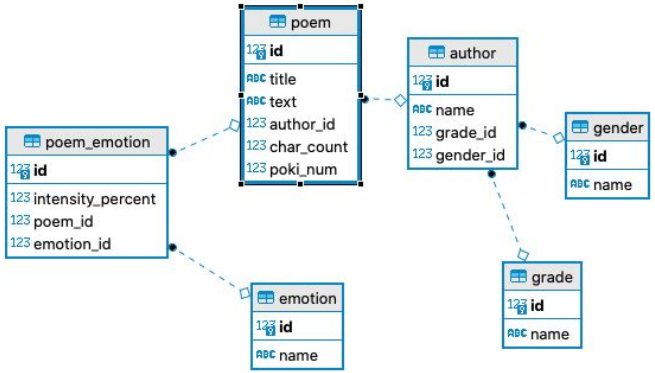
```
SELECT text
FROM poem;
```

End with semicolon



Format of a Query

the column(s)
to retrieve




```
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```
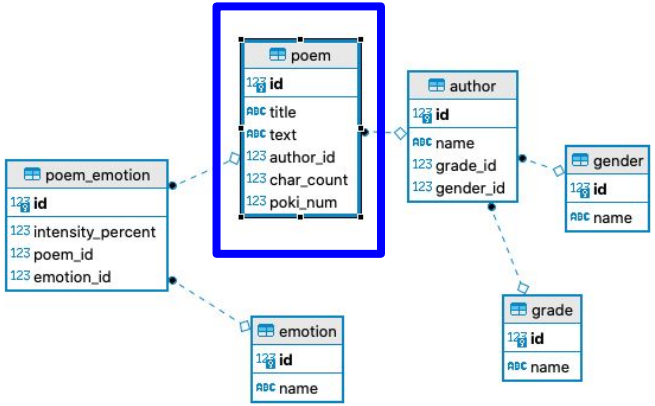
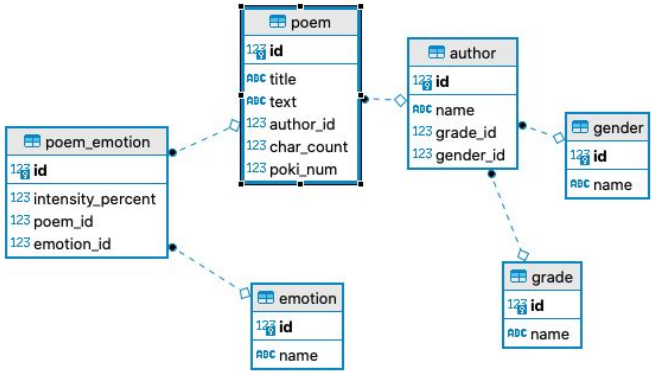

Format of a Query




```
SELECT text
FROM poem;
```

the table to retrieve from

Format of a Query




```
SELECT text
FROM poem
WHERE char_count < 20;
```

Only return rows satisfying this condition.

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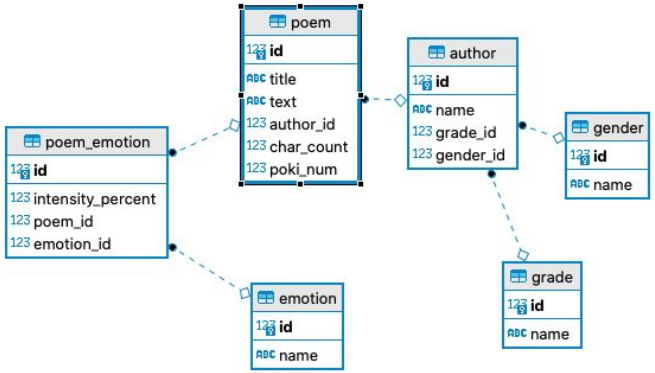
Format of a Query




```
SELECT text
FROM poem
WHERE char_count < 20
LIMIT 5;
```

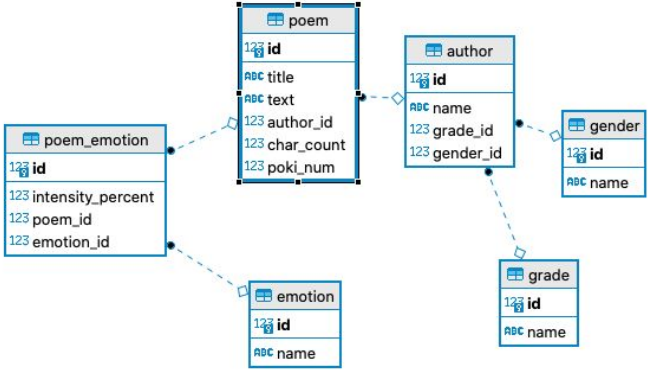
Just return the first
5 results.

Selecting single columns from a table

You can also specify individual columns to return, each separated by a ‘,’:

```
SELECT name, grade_id
FROM author
LIMIT 5;
```

	name character varying	grade_id integer
1	a	1
2	aab	1
3	aadhya	1
4	aaliyah	1
5	aanna	1

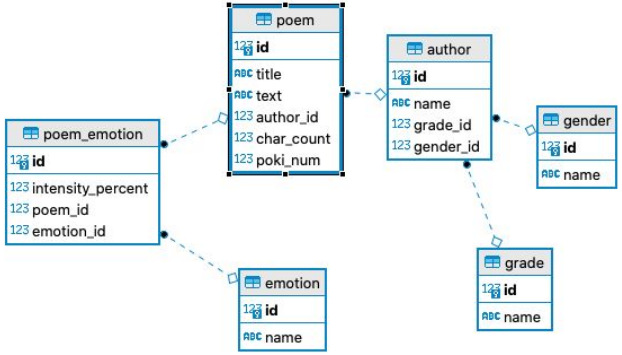


Selecting all columns from a table

A shorthand to **SELECT ALL** is to use a *:

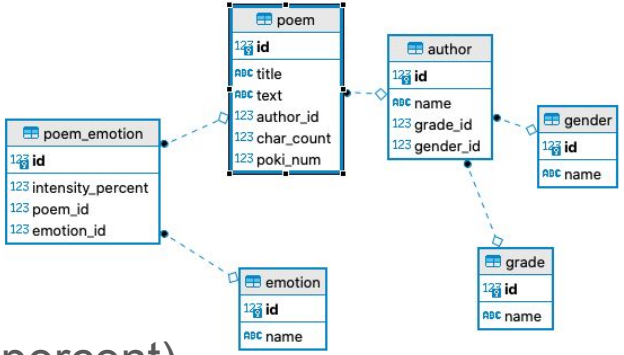
```
SELECT *
FROM emotion;
```

	id [PK] integer	name character varying
1	1	Anger
2	2	Fear
3	3	Sadness
4	4	Joy



Aggregating Data

You may want to summarize your data in different ways. For example you could **COUNT**, **SUM**, **AVERAGE**, or find the **MAX** or **MIN**:




```
SELECT COUNT(id)
FROM author
WHERE grade_id = 4;
```

	count bigint
1	3288

```
SELECT AVG(intensity_percent)
FROM poem_emotion
WHERE emotion_id = 2;
```

	avg numeric
1	45.4740880030086499

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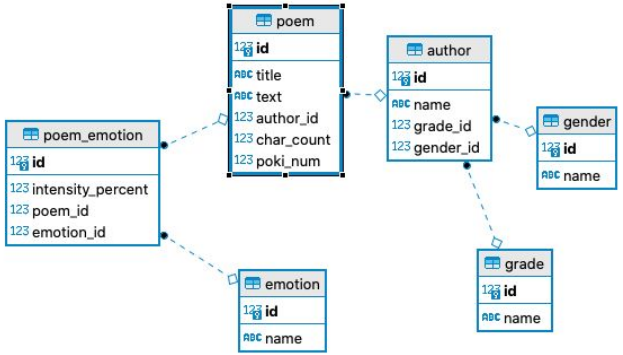
Aggregating Data with GROUP BY

The **GROUP BY** keyword will subdivide the table based on the specified columns. You can then perform aggregations on the subgroups:

```
SELECT COUNT(id)
FROM author
GROUP BY grade_id;
```

	count bigint
1	623
2	2344
3	3464
4	3288
5	1437



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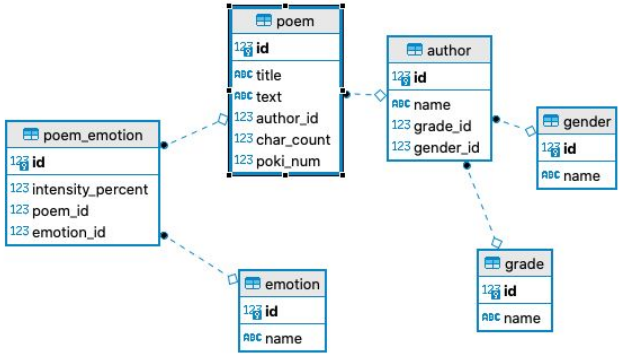
Aggregating Data with GROUP BY

The **GROUP BY** keyword will subdivide the table based on the specified columns. You can then perform aggregations on the subgroups:

```
SELECT grade_id, COUNT(id)
FROM author
GROUP BY grade_id;
```

	grade_id integer	count bigint
1	1	623
2	3	2344
3	5	3464
4	4	3288
5	2	1437



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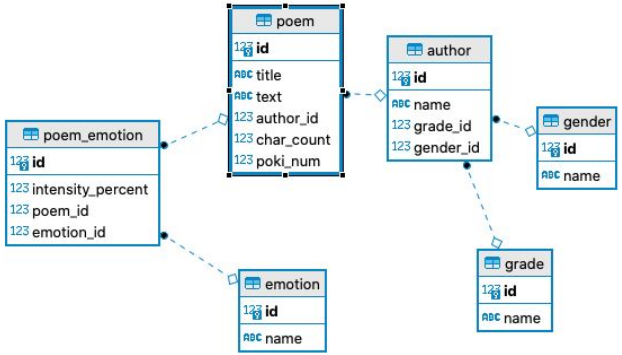
Aggregating Data with GROUP BY

The **GROUP BY** keyword will subdivide the table based on the specified columns. You can then perform aggregations on the subgroups:

```
SELECT grade_id, COUNT(id)
FROM author
GROUP BY grade_id
ORDER BY grade_id;
```

	grade_id integer	count bigint
1	1	623
2	2	1437
3	3	2344
4	4	3288
5	5	3464



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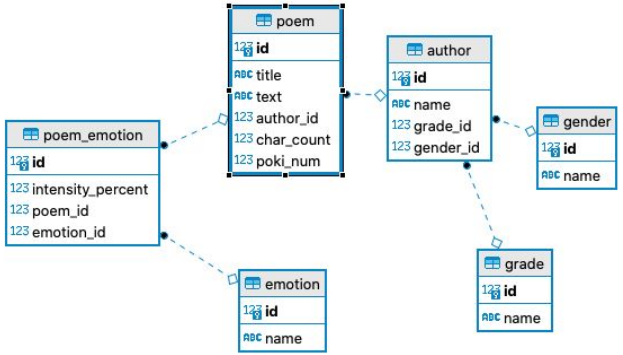

The **GROUP BY** keyword will subdivide the table based on the specified columns. You can then perform aggregations on the subgroups:

```
SELECT grade_id, COUNT(id)
FROM author
GROUP BY grade_id
ORDER BY count DESC;
```

	grade_id integer	count bigint
1	5	3464
2	4	3288
3	3	2344
4	2	1437
5	1	623

By default, ORDER BY sorts in ascending order, but we can change it with DESC.

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Joining Data

Often data will be spread across **multiple tables**. In order to perform an analysis you may need to **combine the data from two or more tables**.

Table A		
id	col_1	col_2
1	23-B	12
2	435	45
3	AB145	23
4	BB	56
5	435	123

Table B		
id	lookup_id	col_a
a1	1	a
a2	2	a
b1	3	b
b2	4	b
a3	5	a

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merge_table			
id	col_1	col_2	col_a
1	23-B	12	a
2	435	45	a
3	AB145	23	b
4	BB	56	b
5	435	123	a

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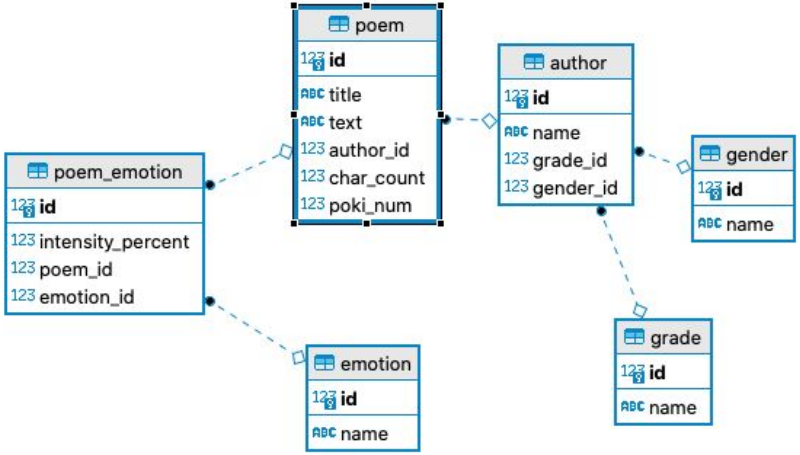
Joining Data - example

Goal: Retrieve the title of each poem along with the author's name.

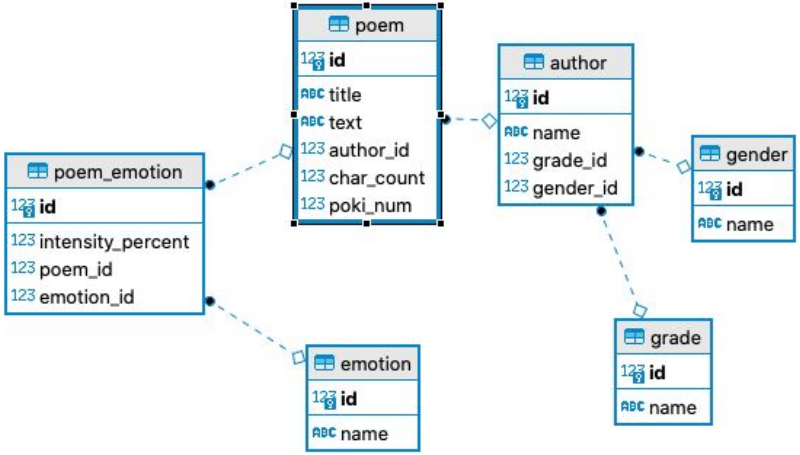


Joining Data - example

Goal: Retrieve the title of each poem along with the author's name.

Process:

a. decide what tables you need
b. decide how to connect your tables
c. decide which columns to select



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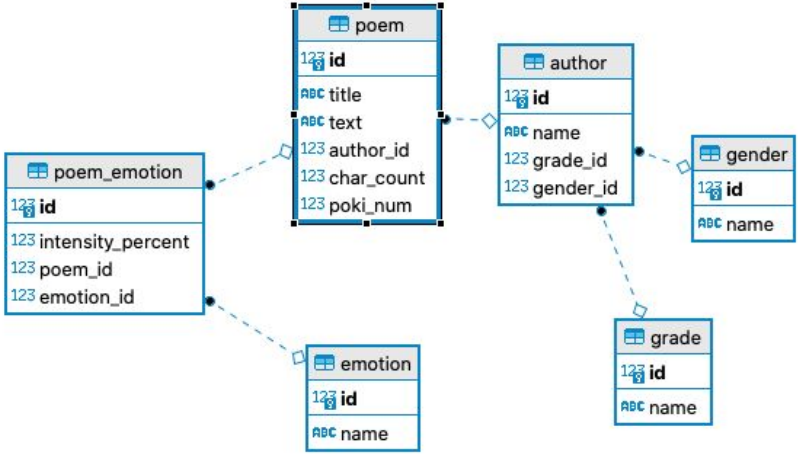

SELECT
FROM
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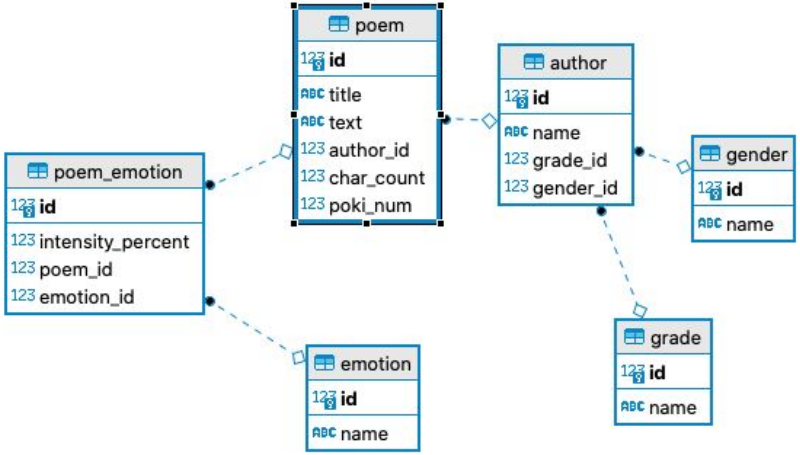

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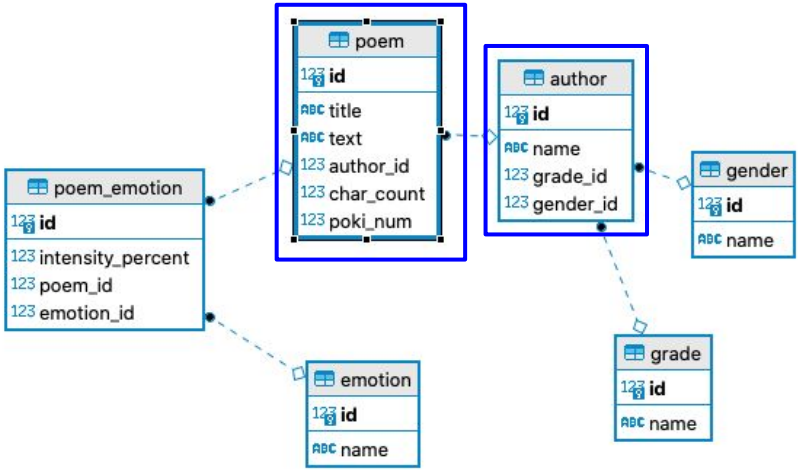

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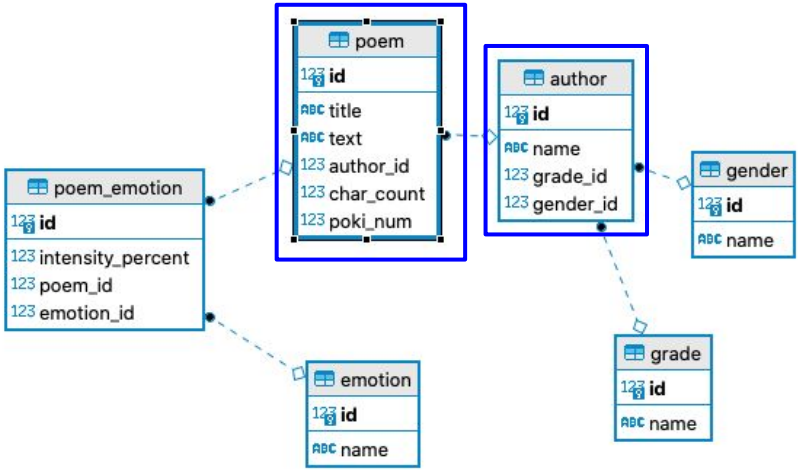


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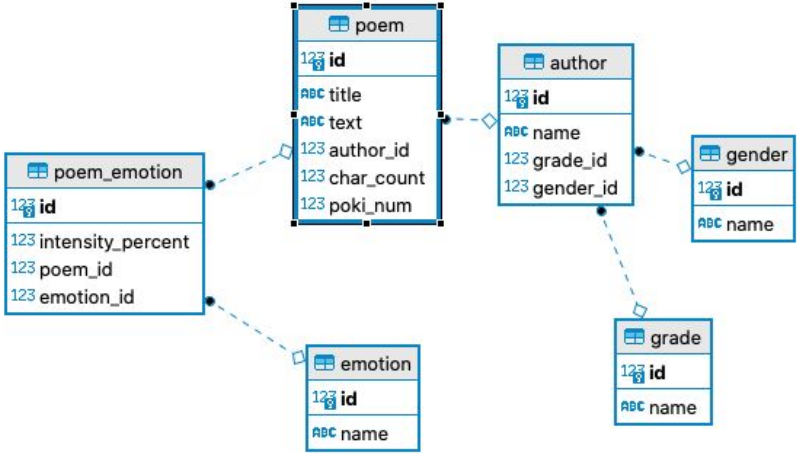


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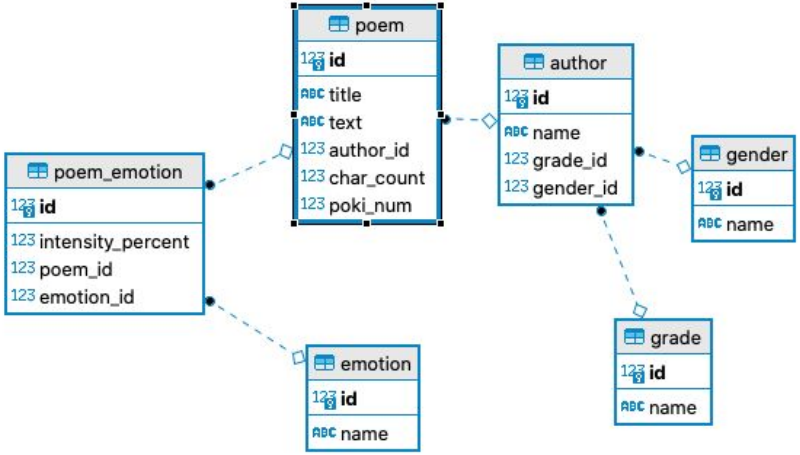


```
SELECT
FROM poem
JOIN author
ON poem.author_id = author.id;
```

Specify columns using *table.column*

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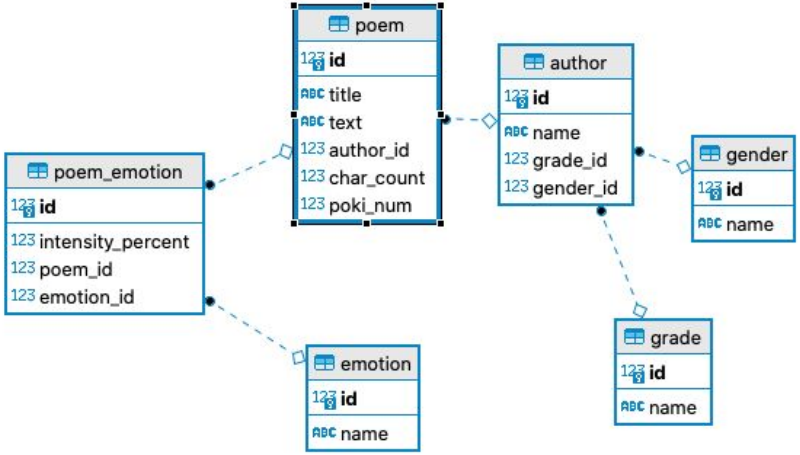


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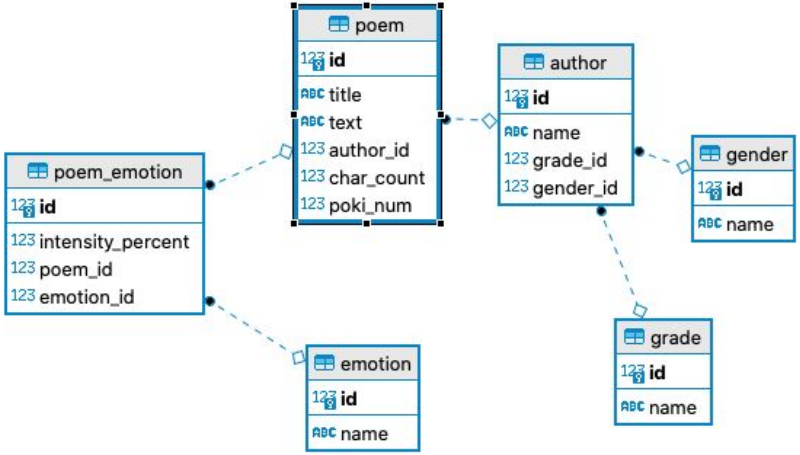


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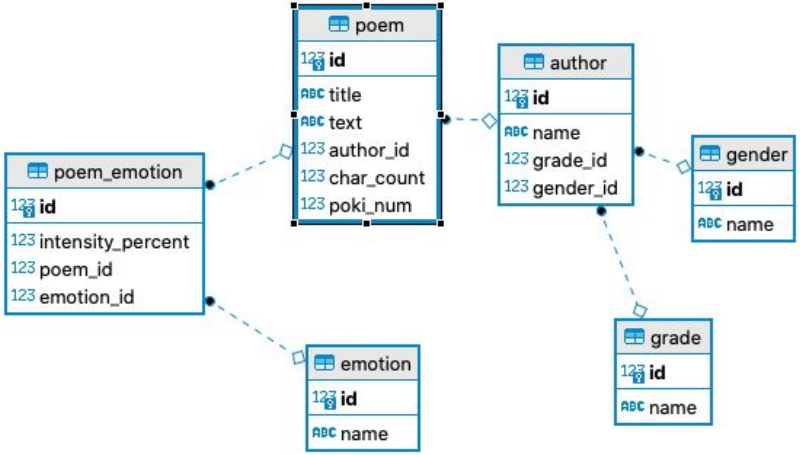


```
SELECT poem.title, author.name
FROM poem
JOIN author
ON poem.author_id = author.id;
```

	title character varying	name character varying
1	Computer	a
2	Angel	aab
3	Nature Nature and Nature	aadhya
4	Jack	aaliyah
5	When I awoke one morning	aanna
6	My Blue Berries and My Cherries	aarathi

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Additional Practice

W3Schools SQL Tutorial - https://www.w3schools.com/sql/default.asp

Khan Academy - https://www.khanacademy.org/computing/computer-programming/sql

DataCamp - https://learn.datacamp.com/skill-tracks/sql-fundamentals

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