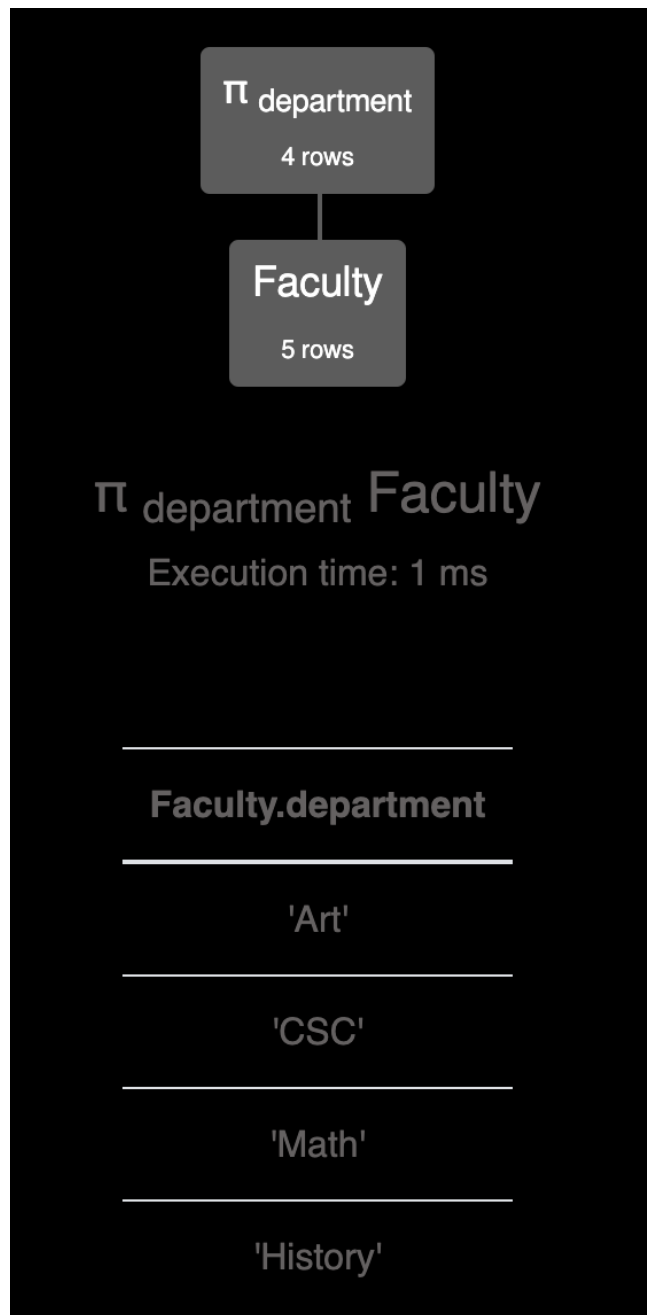


John Doll

Part 2.3



Part 2.12

```
1 σ room = 'H225' ∨ facId = 'F101' (Class)
```

[▶ execute query](#) [Download](#) [History](#)

σ room = 'H225' or facId = 'F101'
3 rows

Class
6 rows

Part 2.18

```
1 π stuId, classNumber
2 (σ grade = 'B'
3  (Enroll))
```

[▶ execute query](#)

π stuId, classNumber
2 rows

σ grade = 'B'
2 rows

Enroll
9 rows

Part 3.4

```
1 π lastName, classNumber, grade (Student ⋈ Enroll)
2
```

[▶ execute query](#) [Download](#)

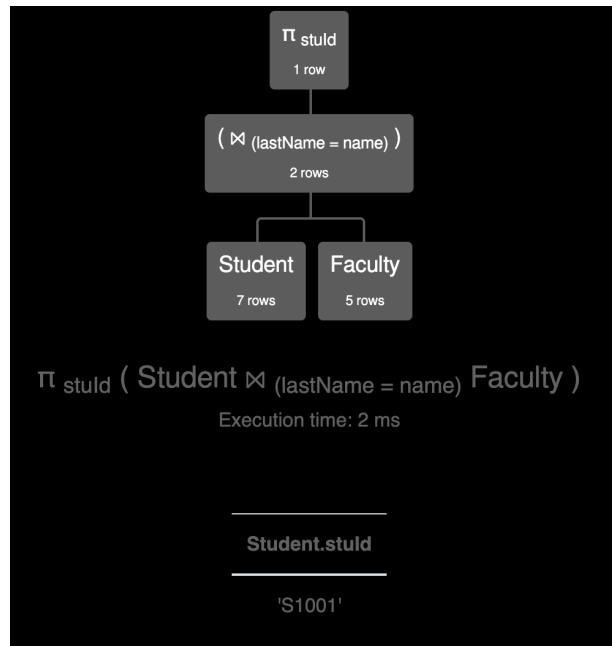
The diagram illustrates the execution of the query $\pi_{\text{lastName, classNumber, grade}} (\text{Student} \bowtie \text{Enroll})$. It shows a hierarchical structure where the final result is a projection of 9 rows. This result is derived from a join operation (\bowtie) between the 'Student' table (7 rows) and the 'Enroll' table (9 rows). The join operation itself produces 9 rows.

Part 3.6

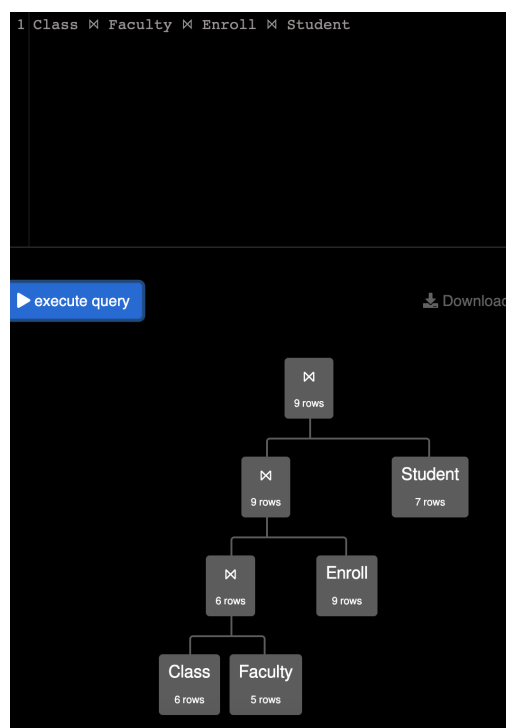
```
1 π stuId (Student ⋈ (lastName = name) Faculty)
2
```

[▶ execute query](#) [Download](#)

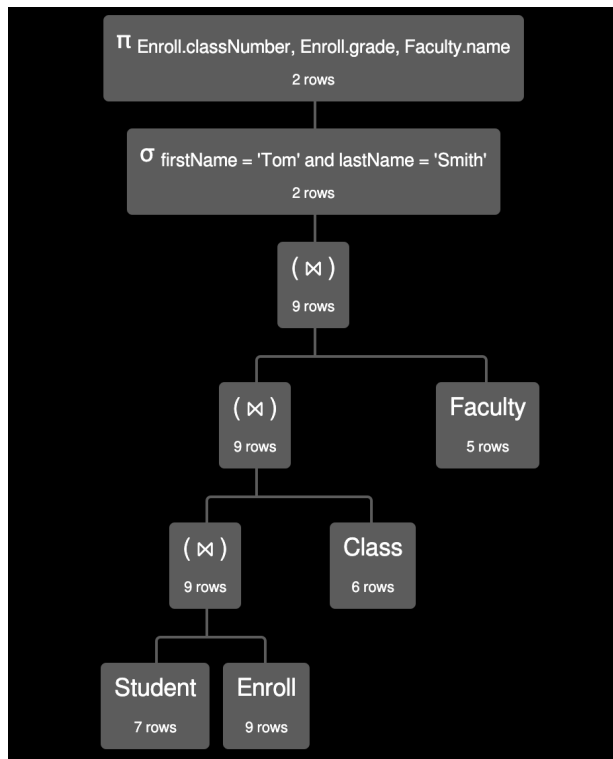
The diagram illustrates the execution of the query $\pi_{\text{stuId}} (\text{Student} \bowtie (\text{lastName} = \text{name}) \text{Faculty})$. It shows a hierarchical structure where the final result is a projection of 1 row. This result is derived from a join operation (\bowtie) between the 'Student' table (7 rows) and a selection operation ($\sigma_{\text{lastName} = \text{name}}$) applied to the 'Faculty' table (5 rows). The selection operation produces 2 rows, and the join operation produces 2 rows.



Part 3.8



Part 4.5



Challenge 1:

```
graph TD; Q1["σ major = 'History' and credits ≤ 10  
1 row"] --- S["Student  
7 rows"];
```

The diagram shows a query execution plan for a filter operation. The filter is $\sigma_{\text{major} = \text{'History'} \text{ and } \text{credits} \leq 10}$, which results in 1 row. This result is then joined with the Student table, which has 7 rows.

$\sigma_{\text{major} = \text{'History'} \text{ and } \text{credits} \leq 10} (\text{Student})$
Execution time: 2 ms

Student.stuid	Student.lastName	Student.firstName	Student.major	Student.credits
'S1005'	'Lee'	'Perry'	'History'	3

Challenge 2:

π name, rank, department

5 rows

Faculty

5 rows

π name, rank, department (Faculty)

Execution time: 0 ms

Faculty.name	Faculty.rank	Faculty.department
'Adams'	'Professor'	'Art'
'Tanaka'	'Instructor'	'CSC'
'Byrne'	'Assistant'	'Math'
'Smith'	'Associate'	'History'
'Smith'	'Professor'	'CSC'

Challenge 3:

π classNumber, room

6 rows

σ name = 'Byrne'

6 rows

\bowtie (facid = faclet)

30 rows

Faculty

5 rows

Class

6 rows

π classNumber, room (σ name = 'Byrne' (Faculty \bowtie (facid = faclet) Class))

Execution time: 1 ms

Class.classNumber	Class.room
'ART103A'	'H221'
'CSC201A'	'M110'
'CSC203A'	'M110'

Challenge 4:

$\sigma_{\text{classNumber} = \text{'ART103A'} \text{ and } \text{major} = \text{'History'}}$
 6 rows

$(\bowtie_{(\text{stuld} = \text{stuld})})$
 63 rows

Student (7 rows) Enroll (9 rows)

$\sigma_{\text{classNumber} = \text{'ART103A'} \text{ and } \text{major} = \text{'History'}} (\text{Student} \bowtie_{(\text{stuld} = \text{stuld})} \text{Enroll})$
 Execution time: 1 ms

Student.stuld	Student.lastName	Student.firstName	Student.major	Student.credits	Enroll.st
'S1001'	'Smith'	'Tom'	'History'	90	'S1001'
'S1001'	'Smith'	'Tom'	'History'	90	'S1002'
'S1001'	'Smith'	'Tom'	'History'	90	'S1010'
'S1005'	'Lee'	'Perry'	'History'	3	'S1001'
'S1005'	'Lee'	'Perry'	'History'	3	'S1002'
'S1005'	'Lee'	'Perry'	'History'	3	'S1010'

Challenge 5:

$\pi_{\text{lastName, firstName, classNumber, grade}}$
 28 rows

$\sigma_{\text{grade} = \text{'A'} \text{ or } \text{grade} = \text{'B'}}$
 28 rows

$(\bowtie_{(\text{stuld} = \text{stuld})})$
 63 rows

Student (7 rows) Enroll (9 rows)

$\pi_{\text{lastName, firstName, classNumber, grade}} \sigma_{\text{grade} = \text{'A'} \text{ or } \text{grade} = \text{'B'}} (\text{Student} \bowtie_{(\text{stuld} = \text{stuld})} \text{Enroll})$
 Execution time: 1 ms

Student.lastName	Student.firstName	Enroll.classNumber	Enroll.grade
'Smith'	'Tom'	'ART103A'	'A'
'Smith'	'Tom'	'MTH103C'	'B'
'Smith'	'Tom'	'CSC201A'	'B'