Relational Algebra:
Basic Operators for Reducing Relations

Computing on Data

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Learning Objectives

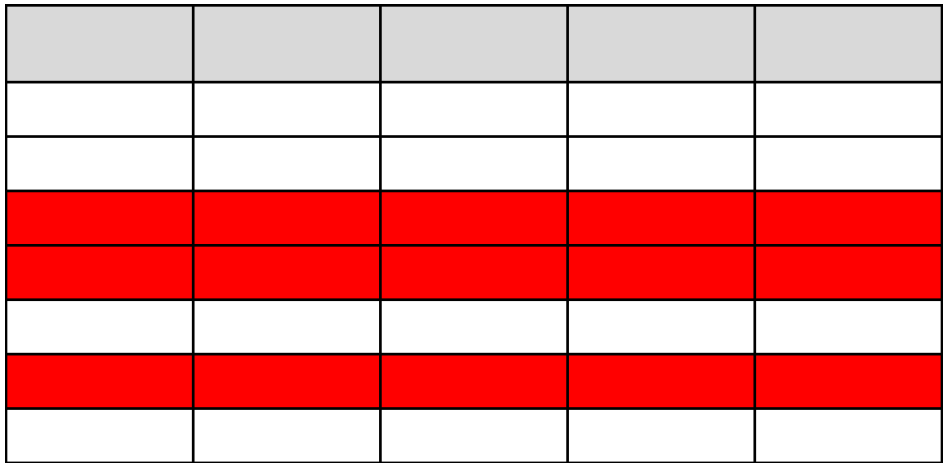
By the end of this video, you will be able to:

- Identify the basic operators that reduce tables to what we want.
- Use these operators to write RA expressions.

Reduction Operators

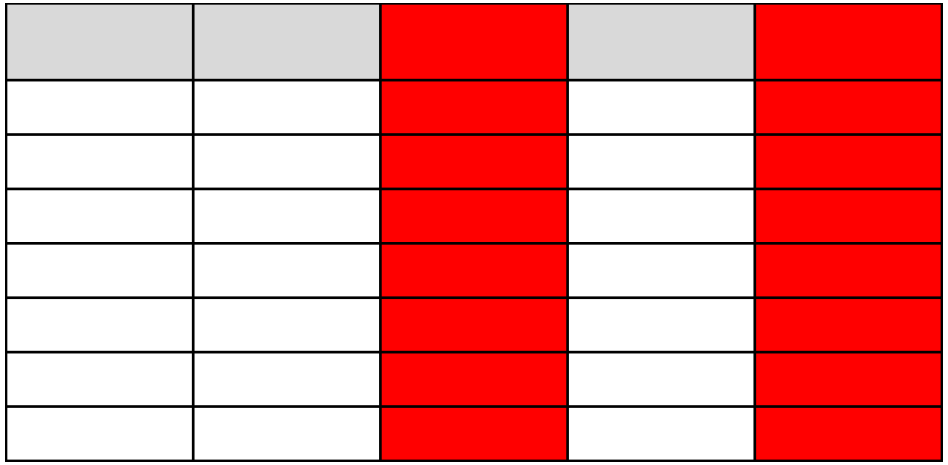
- Reducing rows: Selection: σ

Reducing rows from a table



- Reducing columns: Projection: π

Reducing columns from a table



Selection σ

- Notation: $\sigma_c(R)$
- Input: relation *R*
- Parameters: *c* is a condition: =, <, >, and, or, not.
- Output:
  - A relation as a subset of *R* that satisfies condition c
  - Schema: same as *R*

- What is the major of Bugs Bunny?
  - $\sigma_{\text{name}=\text{"Bugs Bunny"}}(\text{Students})$

id	name	major	birthday
1	Bugs Bunny	CS	2004-11-06
2	Donald Duck	Bio	1997-02-01
3	Peter Pan	Econ	1998-10-01
4	Mickey Mouse	CS	1995-04-01

Example relation Students

Selection Examples

- *Q1: Find beers that are made by “AB InBev”.*
- *Q2: Find beers that are made by ”Boston Beer”.*
- *Q3: Find beers that are sold for less than $5.*

Projection π

- Notation: $\pi_{A_1,\ldots,A_n}(R)$
- Input: relation $R(B_1, \ldots, B_m)$
- Parameters: $\{A_1, \ldots, A_n\} \subseteq \{B_1, \ldots, B_m\}$
- Output:
  - A relation of tuples with attribute $A_1, \ldots, A_n$ from *R*
  - Duplicates are removed.
  - Schema: $\{A_1, \ldots, A_n\}$

- What majors do students have?
  - $\pi_{\text{major}}(\text{Students})$

id	name	major	birthday
1	Bugs Bunny	CS	2004-11-06
2	Donald Duck	Bio	1997-02-01
3	Peter Pan	Econ	1998-10-01
4	Mickey Mouse	CS	1995-04-01

Example relation Students

Projection Examples

- *Q1: Find the brewers of beers.*

- *Q2: Find each bar-beer pair where a bar is selling a beer.*

Food for Thought

Sigma and Pi often are used together. Can you explain why?

Sigma Pi University of Illinois (SigmaPi, 1908)

References

- *SigmaPi, 1908*. Sigma Pi University of Illinois [Online image]. Retrieved from https://www.facebook.com/PhiofSigmaPi/.