Relational Algebra Examples

95 – 703

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Relational Algebra Operations

- Selection: $\sigma_{predicate}(R)$
- Projection: $\pi_{col1, \ldots, coln}(R)$
- Cartesian Product: $R \times S$
- Join Operations:
  Theta-join, Equi-join, Natural join, Outer join, Semi-join
- Union: $R \cup S$
- Set Difference: $R - S$
- Intersection: $R \cap S$
- Division: $R \div S$

Exercise 1

- List book ID and book title for every book in computer category

$\pi_{ISBN, Title}(\sigma_{Category = \text{'COMPUTER'}}(Books))$

Exercise 2

- List title, price, and cost of books that have expected profit of less than 20% of the book's cost

$\pi_{Title, Retail, Cost}(\sigma_{(Retail - Cost) < 0.2 * Cost}(Books))$

Exercise 3

- Find the book code and title for every book published by "Reed-N-Rite" or book with price over $25

$$\pi_{\text{ISBN, Title}}(\sigma_{\text{Retail} > 25 \text{ OR } \text{Name} = \text{'REED-N-RITE'}}(\text{Books} \bowtie \text{Publisher}))$$

Exercise 4

- List author IDs of books that are in either children or family life categories. Use union operation.

$$\pi_{\text{AuthorID}}(\sigma_{\text{Category} = \text{'FAMILY LIFE'}}(\text{Books} \bowtie \text{BookAuthor})) \cup \pi_{\text{AuthorID}}(\sigma_{\text{Category} = \text{'CHILDREN'}}(\text{Books} \bowtie \text{BookAuthor}))$$

Exercise 5

- List customer number of those customers who did not place any order in April 2009.
  Use set difference.

$$\pi_{\text{Customer\#}}(\text{Customers}) - \pi_{\text{Customer\#}}(\sigma_{\text{ordderdate} >= \text{'01-Apr-2009'} \text{AND } \text{ordderdate} <= \text{'30-Apr-2009'}}(\text{Orders}))$$

Exercise 6

- List the ID, title, and price for "Family Life" books with price that is less than $50.
  Use a set operation.

$$\pi_{\text{ISBN, Title, Retail}}(\sigma_{\text{Retail} < 50}(\text{Books})) \cap \pi_{\text{ISBN, Title, Retail}}(\sigma_{\text{Category} = \text{'FAMILY LIFE'}}(\text{Books}))$$

Exercise 7

- Find any book that cost more than $15 and is either published by “Reading Materials Inc.” or is in the “Family Life” category.

  List title, publisher ID, cost, and category.

$\pi_{\text{Title, PubID, Cost, Category}}$

$(\sigma_{\text{(Category = 'FAMILY LIFE' OR Name = 'Reading Materials Inc.') AND Cost >15}}$
(Books $\bowtie$ Publisher))

Exercise 8

- Find any information we have in the database on authors who wrote computer books. Only the information in Author table is to be included.

Author $\triangleright$
(BookAuthor $\bowtie$ ($\sigma_{\text{Category = 'COMPUTER'}}$ (Books)))

Exercise 9

- List book code and book title for every pair of books that have the same publisher and are of the same category

$\pi_{\text{B1.ISBN, B1.Title, B2.ISBN, B2.Title}}$
$(\sigma_{\text{B1.PubID = B2.PubID AND B1.Category = B2.Category}}$
$\text{AND B1.ISBN < B2.ISBN}\ (\rho_{B1}(\text{Books}) \times \rho_{B2}(\text{Books}))\ )$

Exercise 10

- List book id and title for books in cooking category. For books that were ordered include the order# and quantity of the book on that order.

$\pi_{\text{ISBN, Title, Order#, Quantity}}$
$(\sigma_{\text{Category = 'COOKING'}}$ (Books $\rtimes$ OrderItems)

Exercise 11

- Do we get all our books in the cooking category from a single publisher? If we do, then provide the name and ID of the publisher.

$$\pi_{\text{PubID, Name, ISBN}} (\text{Books} \bowtie \text{Publisher}) \div \pi_{\text{ISBN}} (\sigma_{\text{Category = 'COOKING'}} (\text{Books}))$$