---------- WEEK 14

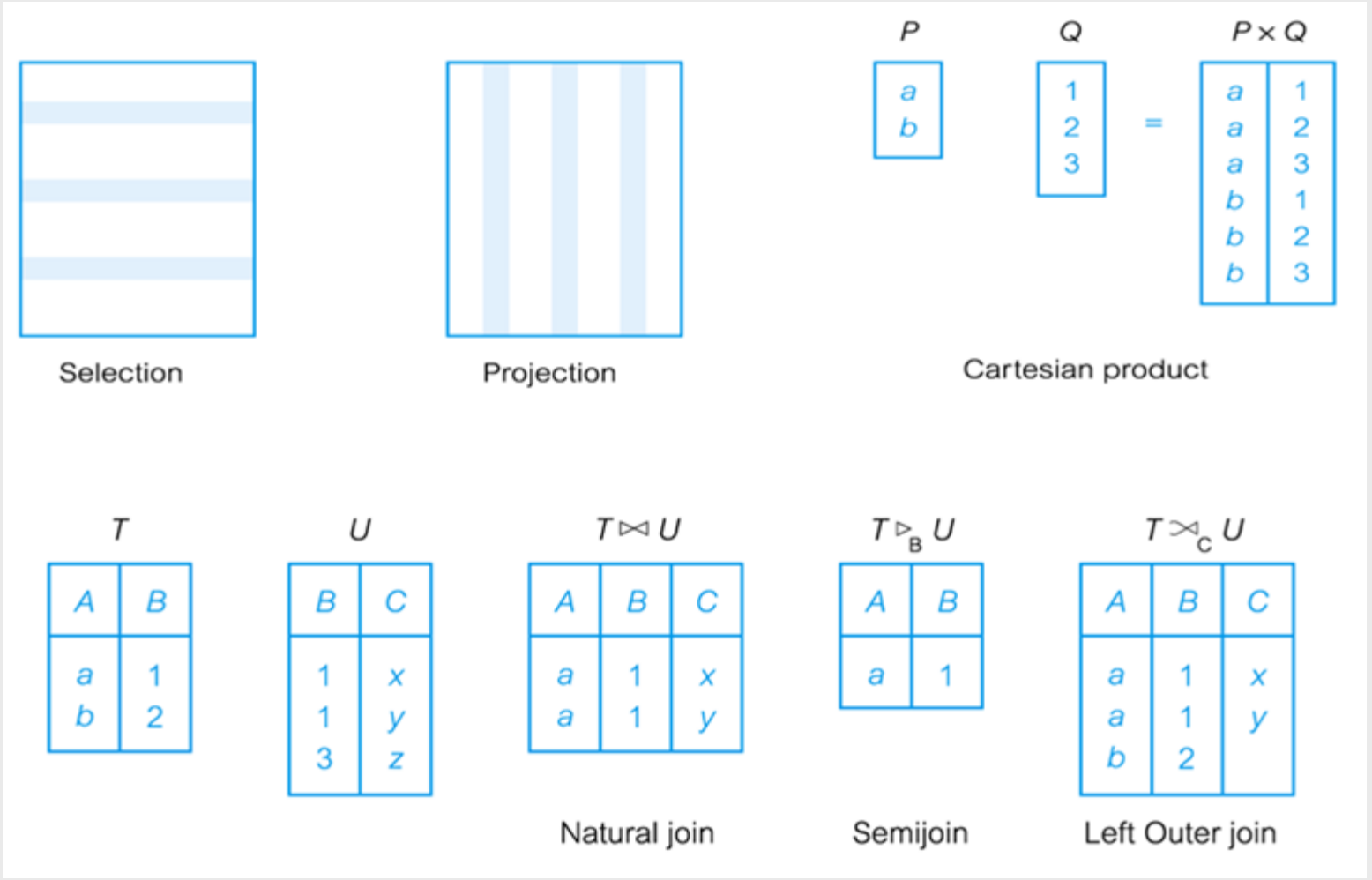
Relational Algebra and SQL

(Set Operation)

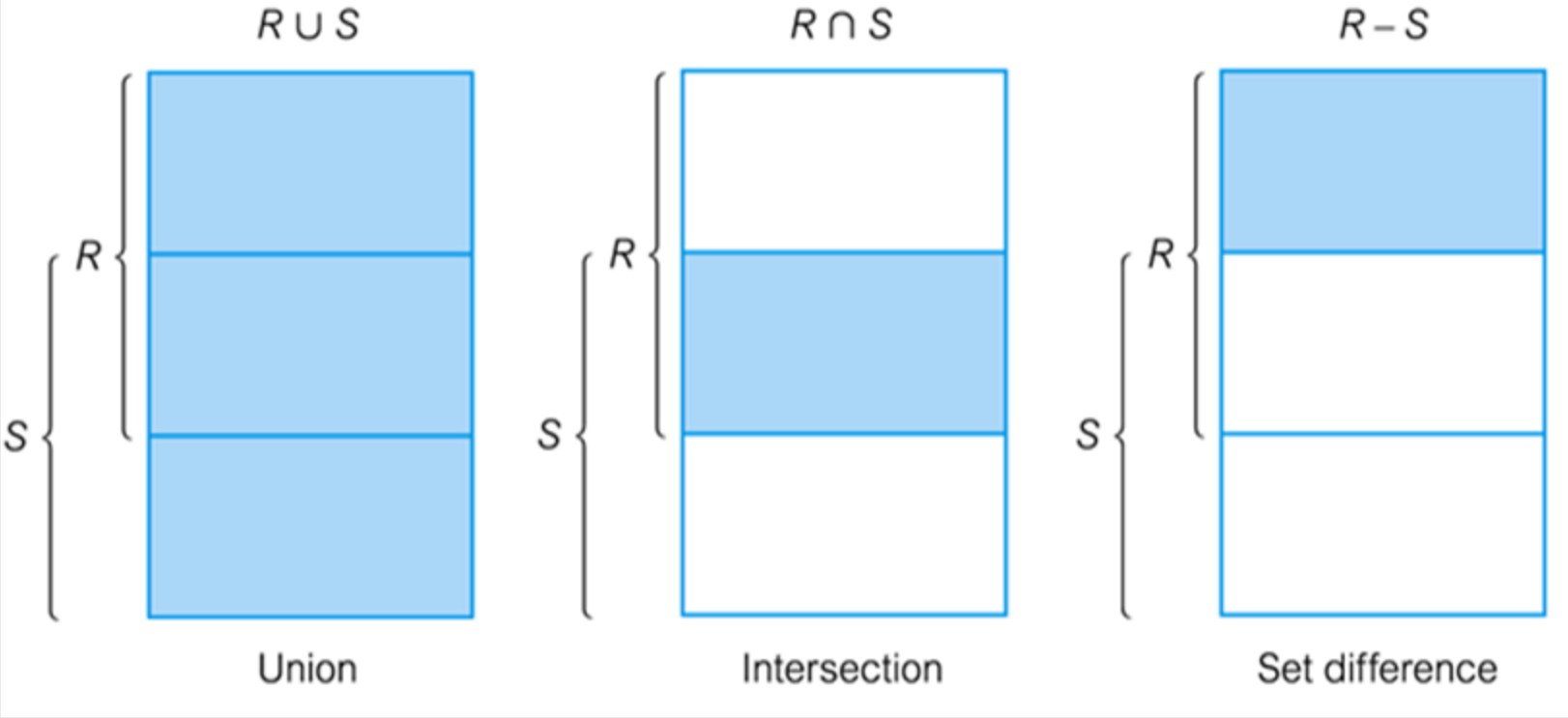
Objectives

- Relational Algebra on Set Operation:
  (Union, Difference and Intersection)
- SQL on Union, Difference and Intersection
- Sub-query and Nested queries.

Relational Algebra Operations



Relational Algebra Operations



Union

- **R ∪ S**
  - **Union of two relations R and S defines a relation that contains all the tuples of R, or S, or both R and S, duplicate tuples being eliminated.**
  - **R and S must be union-compatible.**

- **If R and S have *I* and *J* tuples, respectively, union is obtained by concatenating them into one relation with a maximum of (*I* + *J*) tuples.**

Example - Union

- **List all cities where there is either a branch office or a property for rent.**

$$\Pi_{city}(Branch) \cup \Pi_{city}(PropertyForRent)$$

city
London
Aberdeen
Glasgow
Bristol

Set Difference

- **R – S**
  - **Defines a relation consisting of the tuples that are in relation R, but not in S.**
  - **R and S must be union-compatible.**

Example - Set Difference

- **List all cities where there is a branch office but no properties for rent.**

$$\Pi_{city}(Branch) - \Pi_{city}(PropertyForRent)$$

city
Bristol

Intersection

- **$R \cap S$**
  - **Defines a relation consisting of the set of all tuples that are in both R and S.**
  - **R and S must be union-compatible.**

- **Expressed using basic operations:**

  $R \cap S = R - (R - S)$

Example - Intersection

- **List all cities where there is both a branch office and at least one property for rent.**

$$\Pi_{city}(Branch) \cap \Pi_{city}(PropertyForRent)$$

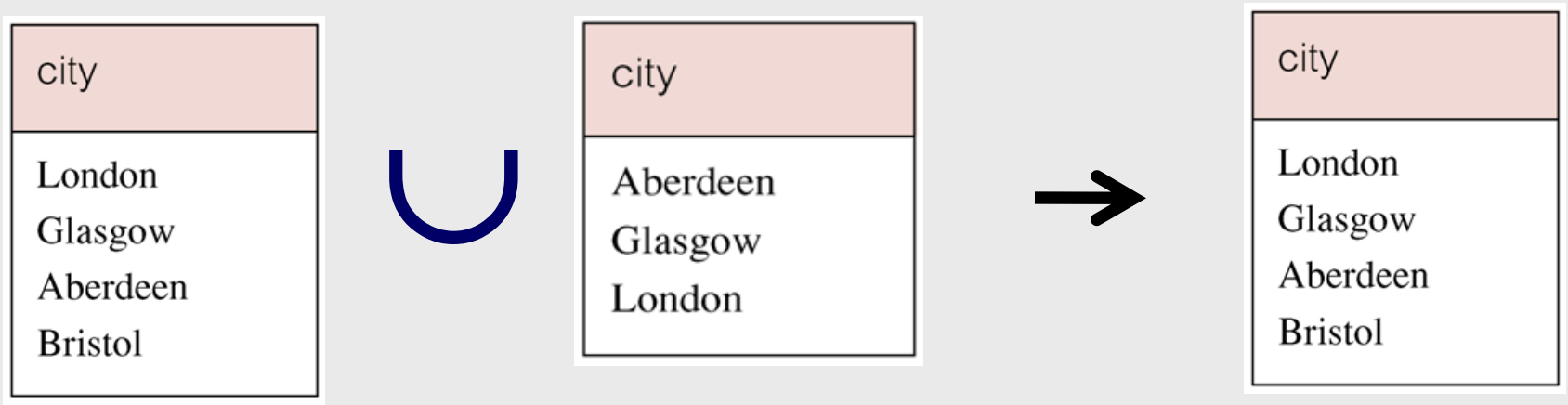
city
Aberdeen
London
Glasgow

SQL on Union, Intersection and Difference

Example : SQL on UNION

List all cities where there is either a branch office or a property.

```
(SELECT city FROM Branch)
UNION
(SELECT city FROM PropertyForRent);
```



Example : SQL on INTERSECTION

List all cities where there is both a branch office and a property.

```
(SELECT city FROM Branch)
INTERSECT
(SELECT city FROM PropertyForRent);
```

Example : SQL on DIFFERENCE

List of all cities where there is a branch office but no properties.

```
(SELECT city FROM Branch)
MINUS
(SELECT city FROM PropertyForRent);
```