

Directed Work 4

Objectives:

This exercise aims to develop students' understanding of relational algebra by practicing the formulation of precise queries over a given relational schema. It reinforces core database concepts such as selection, projection, join, union, and difference, while enhancing logical reasoning and query-building skills. Through real-world scenarios—like managing geopolitical data or tracking meals and guest preferences—students learn how to model data relationships, interpret schema constraints, and translate everyday information needs into formal database operations, preparing them for practical database use and theoretical comprehension alike.

Exercise

Let the following relational model be given:

- Country(code, country_name, continent, area, HeadOfState, #capital)
Capital references City.city_code
- City(city_code, city_name, #country_code)
country_code references Country.code
- Languages(#country_code, language)
country_code references Country.code

Express the following queries in relational algebra:

1. What are all the languages spoken in the world?
2. Give the name of each country and the name of its head of state.
3. Give the names of the countries whose area exceeds 1,000,000 m².
4. Give the code and name of all European countries.
5. What is the area of Algeria?
6. Who is the head of state of Cameroon?
7. On which continent is Brazil located?
8. What is the code of the country whose capital has the code 555?
9. Give the names of the cities located in the country with code MEX.
10. Give the names of all the countries in Africa and Asia.
11. Give the names of African countries with an area less than 500,000 m².
12. What are the languages spoken both in Belgium and Switzerland, knowing that their codes are respectively BEL and CHE?
13. What are the languages spoken in Belgium but not in Switzerland?
14. What are the languages spoken only in South Africa?
15. Give the names of all the cities in Finland.

16. Give the names of all European cities.
17. Give the names of all European capitals.
18. Give the name of all countries as well as the name of their capital.
19. Give the names of French-speaking African countries.
20. What languages are spoken in Switzerland?