Facultad de Informática UCM.
Databases. Course 2018-2019.
Relational Algebra Exercises.

Exercise 1. Consider the following relational model for expressing in relational algebra the next queries:

```
CLIENTS(ClientNr, Name, Address, PhoneNr, City)
PRODUCTS(ProdCode, Description, Price)
SALES(ProdCode, ClientNr, Quantity, SaleId)
```

CLIENTS stores information about every possible client of our company. PRODUCTS stores information regarding every product type on sale in any shop of our company. SALES relates the previous tables, using attribute ProdCode to refer to a product and attribute ClientNr to refer to the client that product was sold.

1. Write a query that shows the name of the clients from Paris.

2. Write a query to get the code and description of those products that have their description exactly equal to their code.

3. Obtain the name of the clients, their sale identifiers and que quantity sold for those products for which more than 500 items were sold

4. Get the name of the clients that have not bought any product.

5. Get the name of those clients that have bought all product types offered by our company (**Division operation**).

6. Get the identifiers of those sales that have sold more items than the sale with Id 18.

7. Get the product codes of those product types not bought from Paris.

8. Get the product codes that have been sold in Paris as well as in Berlin.

9. Get the cities where all product types have been sold (**Division operation**).

Let us suppose that the following relation INVOICES is added to our database, and an attribute is added to SALES to relate sales to the corresponding invoice. The attribute `Overdue` has value '0' if the invoice is unpaid and '1' otherwise. Note that an invoice can correspond to several sales made by a single client. The resulting database is as follows:

```
CLIENTS(ClientNr, Name, Address, PhoneNr, City)
PRODUCTS(ProdCode, Description, Price)
SALES(ProdCode, InvoiceNr, Quantity, SaleId)
INVOICES(InvoiceNr, Date, Overdue, ClientNr)
```

10. Get the name of the clients that have unpaid invoices.

11. Get the client number of those clients that do not have any unpaid invoice.

Exercise 2. Let us consider the following relational model and express in relational algebra next requests:

```
CAPTAINS(IdCaptain, Name, Age)
BOATS(IdBoat, BoatName, Colour)
BOOKINGS(IdCaptain, IdBoat, Date)
```

1. Write a query that shows the name of the captains that have boooked Boat 103.

2. Show the name of the captains that have booked a red boat.

3. Show the colour of the boats that have been booked by captains over 45 years.

4. Show the name of the captains that have booked at least one boat.

5. Show the name of the captains that have booked a red ship or a green ship.

6. Show the name of the captains that have booked a red ship and a green ship.

7. Show the name of the captains over 20 years that have not booked a red boat.

8. Show the name of the captains that have booked all the boats (**Division operation**).

Exercise 3. Let us consider the following relational model and express in relational algebra the next requests:

```
EMPLOYEE (empName, street, city)
WORKS (empName, companyName, salary)
COMPANY (companyName, city)
MANAGER (name, managerName)
```

1. Show the name of the employees that work in "The Best Bank".

2. Show the name of the employees and the city city where they live that work in "The Best Bank".

3. Show the name of the employees that live in the city where they work.

4. Show the name of the employees with a higher salary than all employees working in "The Small Bank".