# Question 1

a. $\pi_{code}\ country - (\pi_{country1\ as\ code}\ borders \cup \pi_{country2\ as\ code}\ borders)$

b.
```
SELECT  name
FROM    country
        JOIN is_member
        ON   is_member.country = country.code
WHERE   is_member.type <> 'member'
AND     NOT EXISTS (SELECT organization
                    FROM   is_member AS turk
                    WHERE  turk.country = 'TR'
                      AND  turk.organization = is_member.organization
                      AND  turk.type = 'member')
```

c. (i) Lists the names and capitals of countries with a population over 1000000 and whose capitals are not the city associated with an organisation

| name | capital |
|---|---|
| Switzerland | Bern |
| Turkey | Ankara |

(ii) $\pi_{name,\ capital}\ \sigma_{population > 1000000}\ country\ -$
$\pi_{name,\ capital}\ \sigma_{country.code = organization.country\ \wedge\ country.capital = organization.city}$
$(organization \times country)$

(iii)
```
non_organisation_capitals (Name, Capital) :-
    country (Name, Code, Capital, _, Population),
    ¬ cities (Capital, Code),
    Population > 1000000.
cities (City, Country) :-
    organization ( _, City, Country, _ ),
    isNotNull (City),
    isNotNull (Country).
```

d.
```
SELECT  name,
        Length AS Longest
FROM    country
        JOIN borders
        ON  country.code IN (borders.country1, borders.country2)
WHERE   length >= ALL ( SELECT length
                        FROM  borders
                        WHERE country.code IN
                              (borders.country1, borders.country2))
```

e.
```
SELECT  name,
        continent,
        pc_area
FROM    country
        JOIN (SELECT code,
                     100.0* area / SUM (area)
                         OVER (PARTITION BY continent) AS pc_area
              FROM   country
                     JOIN  encompasses
                     ON country.code = encompasses.country
              ) AS  country_pcs
        ON country.code = country_pcs.code
WHERE   pc_area >= 5
```