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Assignment 3

(COP-5725 DBMS)

Date:

22th Oct,2019

Exercise 1

1.

[4 points] What is the meaning of these keywords?

For a database, all the constraints will be immediately applied. A constraint's deferrable characteristic can be used to change this nature. Deferrable constraints are validated at transaction level and not statement level. There are two types of deferrable constraints : INITIALLY IMMEDIATE, INITIALLY DEFERRED.

DIFERRABLE : Allows the database constraint to change its default constraint behaviour.

The deferrable behaviour can be specified by using the below key words following DIFFERABLE key word.

INITIALLY DEFERRED : Unless we commit the data into the database, it won't check for constraints

INITIALLY IMMEDIATE : Constraint is checked when we update, delete or add rows from a table.

2.

[6 points] Why is the action indicated by the keyword INITIALLY DEFERRED DEFERRABLE needed in the scenario above? What is the problem? How is the problem solved?

The Foreign key of country (Code, Capital, Province) is referencing to the attributes (Country, Name, Province) of the City table. Similarly we observe that attributes (Country, Province) of City are referencing to attributes (Country, Name) of Province, attributes of Province (Country) is referencing to attributes (Code) of Country and attributes (Capital, Country, CapProv) of Province are referencing to attributes (Name, Country, Province) of City.

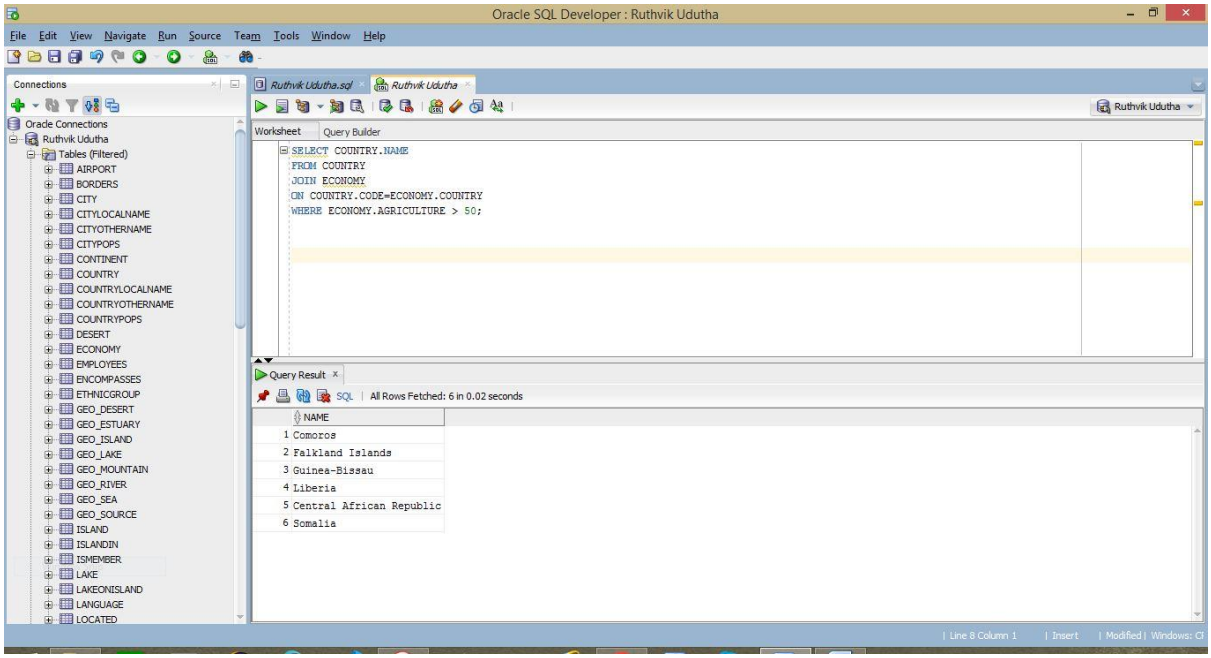
The problem here is at the beginning when no table and rows were created and while we try to create and insert, we will face error due to referential integrity constraint. For example at the time of inserting into country, the error is thrown because City table is not created (and Referential integrity constraint exists on Country since attributes in Country are referencing to a few attributes in City). Similar reasoning can be applied to the other tables as well.

This problem is solved by using the "INITIALLY DEFERRED DEFERRABLE" key words. This allows us to change the database constraint behaviour. Now unless we commit the data into the database, it won't check for referential constraints. Hence we solve the problem by committing the data into the data base after we fill in the tables : Country, City, Province. And from now on the constraints (referential integrity constraint) will be checked (i.e. after committing and not before)

SQL Queries:

1.

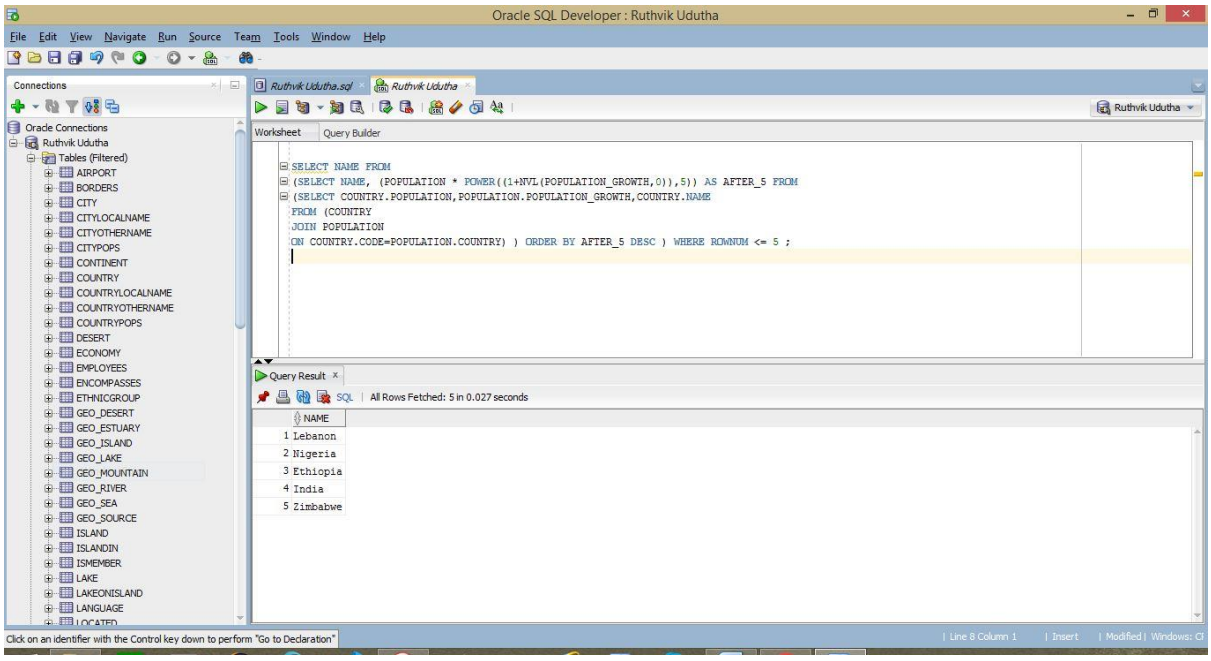
```
SELECT
   country.name
FROM
   country
   JOIN economy ON country.code = economy.country
WHERE
   economy.agriculture > 50;
```



2.

```
SELECT
   name
FROM
   (
      SELECT
         name,
         ( population * power((1 + nvl(population_growth, 0)), 5) ) AS after_5
      FROM
```

```
        (
          SELECT
            country.population,
            population.population_growth,
            country.name
          FROM
            ( country
            JOIN population ON country.code = population.country )
        )
      ORDER BY
        after_5 DESC
  )
WHERE
  ROWNUM <= 5;
```



3.

```
SELECT
  (
    SELECT
      name
    FROM
```

```
  country
WHERE
  code IN (
    SELECT
      "country_used_to"
    FROM
      (
        SELECT
          nvl(wasdependent, 0) AS "country_used_to",
          COUNT(country) AS prev_count
        FROM
          politics
        GROUP BY
          wasdependent
        ORDER BY
          prev_count DESC
      )
    WHERE
      "country_used_to" != '0'
      AND prev_count = (
        SELECT
          MAX(prev_count)
        FROM
          (
            SELECT
              nvl(wasdependent, 0) AS "country_used_to",
              COUNT(country) AS prev_count
            FROM
              politics
            GROUP BY
              wasdependent
            ORDER BY
              prev_count DESC
```

```
                )
            WHERE
                "country_used_to" != '0'
        )
    )
) "c1",
(
  SELECT
    prev_count
  FROM
    (
      SELECT
        nvl(wasdependent, 0) AS "country_used_to",
        COUNT(country) AS prev_count
      FROM
        politics
      GROUP BY
        wasdependent
      ORDER BY
        prev_count DESC
    )
  WHERE
    "country_used_to" != '0'
    AND prev_count = (
      SELECT
        MAX(prev_count)
      FROM
        (
          SELECT
            nvl(wasdependent, 0) AS "country_used_to",
            COUNT(country) AS prev_count
          FROM
            politics
```

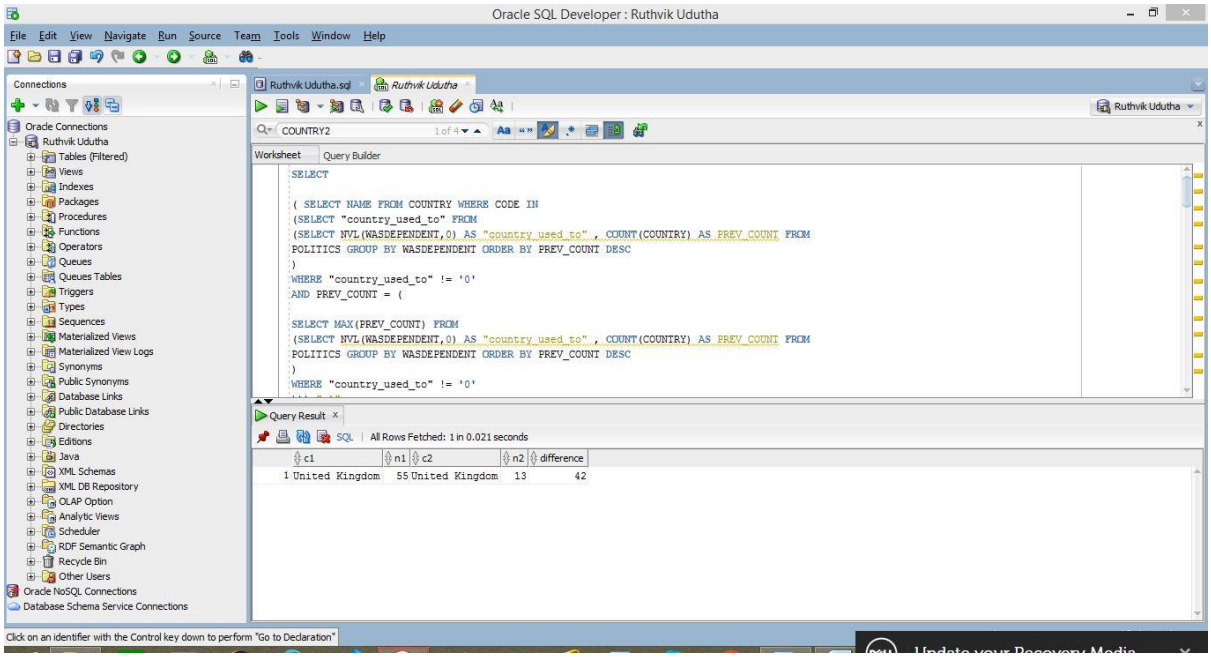
```
            GROUP BY
               wasdependent
            ORDER BY
               prev_count DESC
         )
      WHERE
         "country_used_to" != '0'
   )
) "n1",
(
   SELECT
      name
   FROM
      country
   WHERE
      code IN (
         SELECT
            "country_now"
         FROM
            (
               SELECT
                  nvl(dependent, 0) AS "country_now",
                  COUNT(country) AS now_count
               FROM
                  politics
               GROUP BY
                  dependent
               ORDER BY
                  now_count DESC
            )
         WHERE
            "country_now" != '0'
            AND now_count = (
```

```
            SELECT
              MAX(now_count)
            FROM
              (
                SELECT
                  nvl(dependent, 0) AS "country_now",
                  COUNT(country) AS now_count
                FROM
                  politics
                GROUP BY
                  dependent
                ORDER BY
                  now_count DESC
              )
            WHERE
              "country_now" != '0'
          )
      )
) "c2",
(
  SELECT
    now_count
  FROM
    (
      SELECT
        nvl(dependent, 0) AS "country_now",
        COUNT(country) AS now_count
      FROM
        politics
      GROUP BY
        dependent
      ORDER BY
        now_count DESC
```

```
    )
  WHERE
    "country_now" != '0'
    AND now_count = (
      SELECT
        MAX(now_count)
      FROM
        (
          SELECT
            nvl(dependent, 0) AS "country_now",
            COUNT(country) AS now_count
          FROM
            politics
          GROUP BY
            dependent
          ORDER BY
            now_count DESC
        )
      WHERE
        "country_now" != '0'
    )
) "n2",
( (
  SELECT
    prev_count
  FROM
    (
      SELECT
        nvl(wasdependent, 0) AS "country_used_to",
        COUNT(country) AS prev_count
      FROM
        politics
      GROUP BY
```

```
            wasdependent
        ORDER BY
            prev_count DESC
    )
WHERE
    "country_used_to" != '0'
    AND prev_count = (
        SELECT
            MAX(prev_count)
        FROM
            (
                SELECT
                    nvl(wasdependent, 0) AS "country_used_to",
                    COUNT(country) AS prev_count
                FROM
                    politics
                GROUP BY
                    wasdependent
                ORDER BY
                    prev_count DESC
            )
        WHERE
            "country_used_to" != '0'
    )
) - (
    SELECT
        now_count
    FROM
        (
            SELECT
                nvl(dependent, 0) AS "country_now",
                COUNT(country) AS now_count
            FROM
```

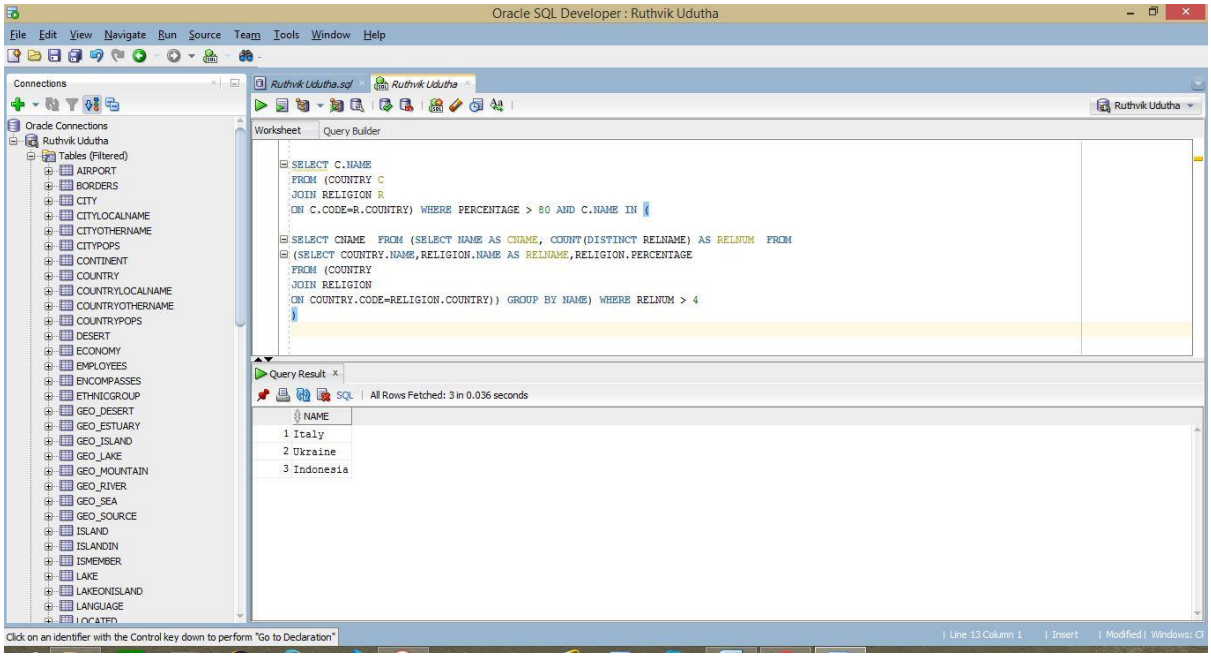
```
            politics
        GROUP BY
            dependent
        ORDER BY
            now_count DESC
    )
WHERE
    "country_now" != '0'
    AND now_count = (
        SELECT
            MAX(now_count)
        FROM
            (
                SELECT
                    nvl(dependent, 0) AS "country_now",
                    COUNT(country) AS now_count
                FROM
                    politics
                GROUP BY
                    dependent
                ORDER BY
                    now_count DESC
            )
        WHERE
            "country_now" != '0'
    )
) ) "difference"
FROM
    dual
```



4.

```
SELECT
   c.name
FROM
   ( country    c
   JOIN religion   r ON c.code = r.country )
WHERE
   percentage > 80
   AND c.name IN (
      SELECT
         cname
      FROM
         (
            SELECT
               name AS cname,
               COUNT(DISTINCT relname) AS relnum
            FROM
               (
                  SELECT
```

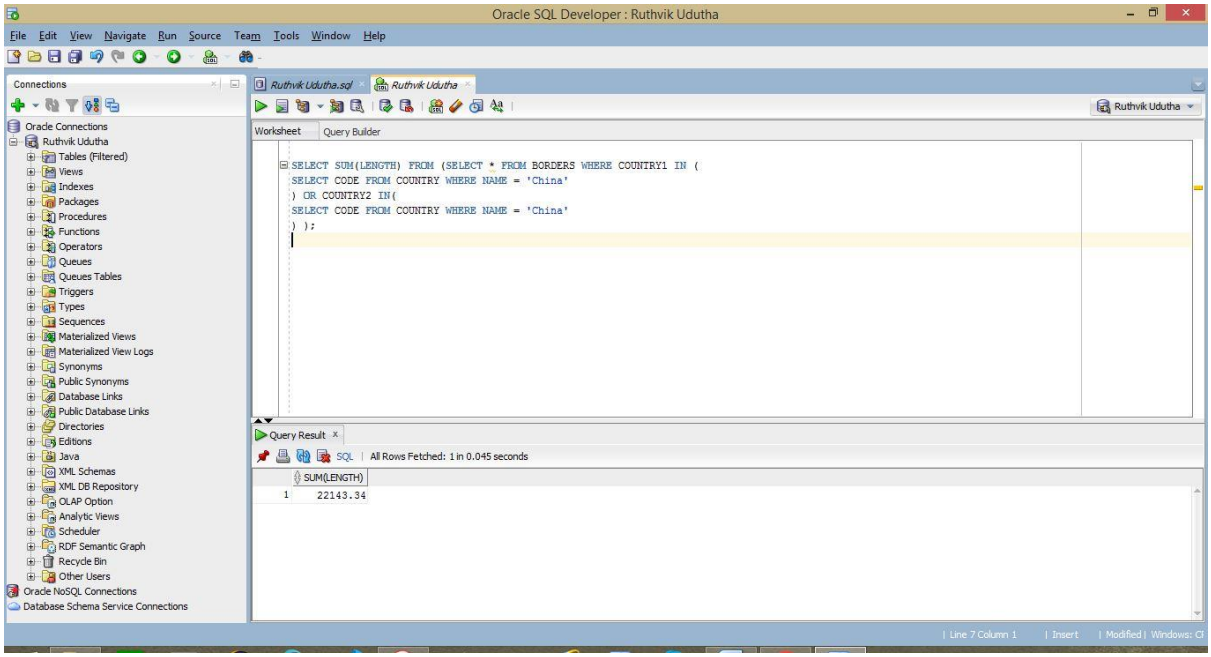
```
            country.name,
            religion.name AS relname,
            religion.percentage
          FROM
            ( country
            JOIN religion ON country.code = religion.country )
        )
      GROUP BY
        name
    )
  WHERE
    relnum > 4
)
```



5.

```
SELECT
  SUM(length)
FROM
  (
    SELECT
```

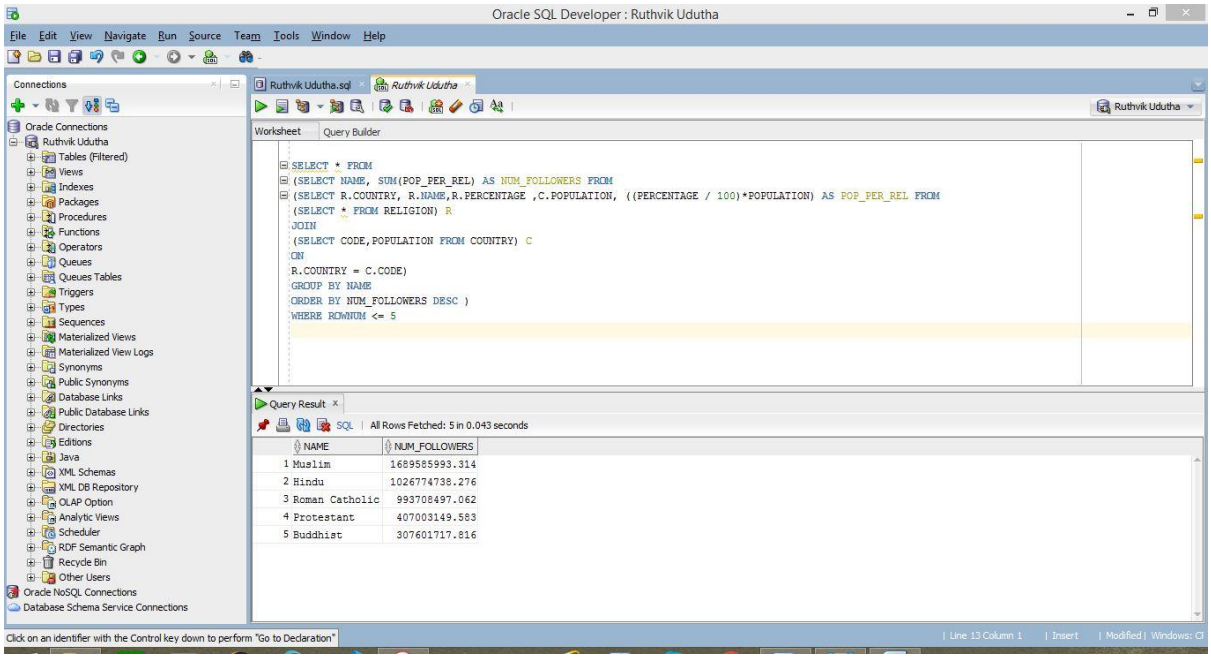
```
    *
  FROM
    borders
  WHERE
    country1 IN (
      SELECT
        code
      FROM
        country
      WHERE
        name = 'China'
    )
    OR country2 IN (
      SELECT
        code
      FROM
        country
      WHERE
        name = 'China'
    )
);
```



6.

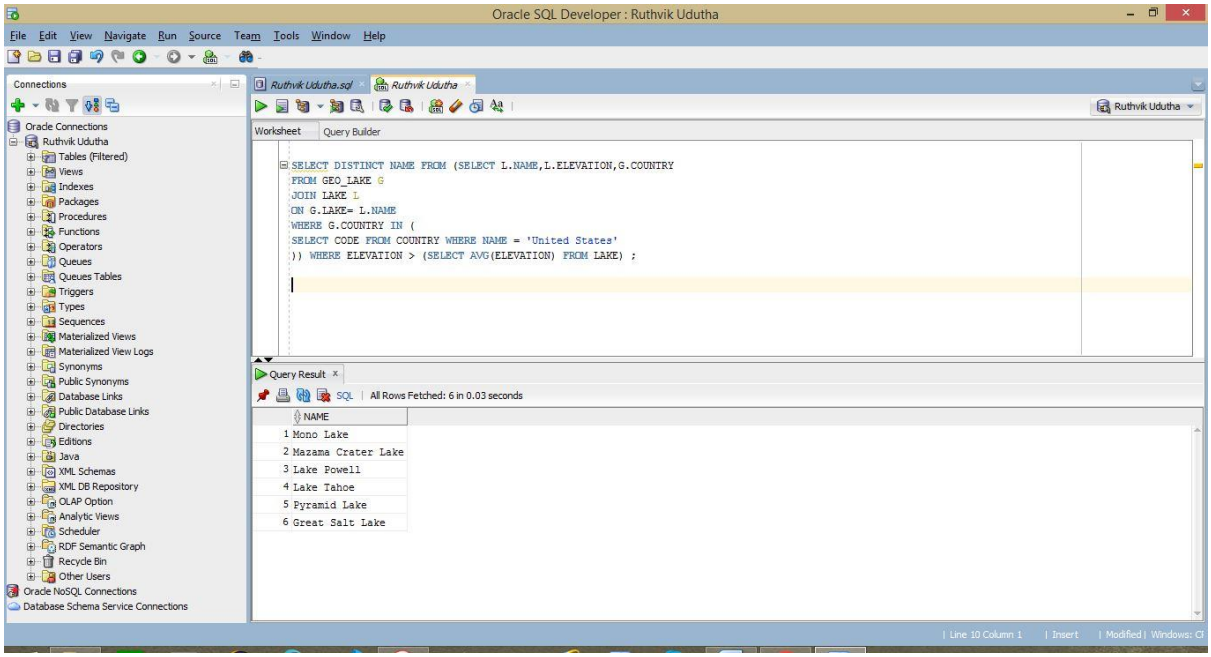
```
SELECT
  *
FROM
  (
    SELECT
      name,
      SUM(pop_per_rel) AS num_followers
    FROM
      (
        SELECT
          r.country,
          r.name,
          r.percentage,
          c.population,
          ( ( percentage / 100 ) * population ) AS pop_per_rel
        FROM
          (
            SELECT
```

```
            *
          FROM
            religion
        )       r
        JOIN (
          SELECT
            code,
            population
          FROM
            country
        ) c ON r.country = c.code
    )
  GROUP BY
    name
  ORDER BY
    num_followers DESC
)
WHERE
  ROWNUM <= 5
```



7.

```
SELECT DISTINCT
   name
FROM
   (
      SELECT
         l.name,
         l.elevation,
         g.country
      FROM
         geo_lake   g
         JOIN lake      l ON g.lake = l.name
      WHERE
         g.country IN (
            SELECT
               code
            FROM
               country
            WHERE
               name = 'United States'
         )
   )
WHERE
   elevation > (
      SELECT
         AVG(elevation)
      FROM
         lake
   );
```

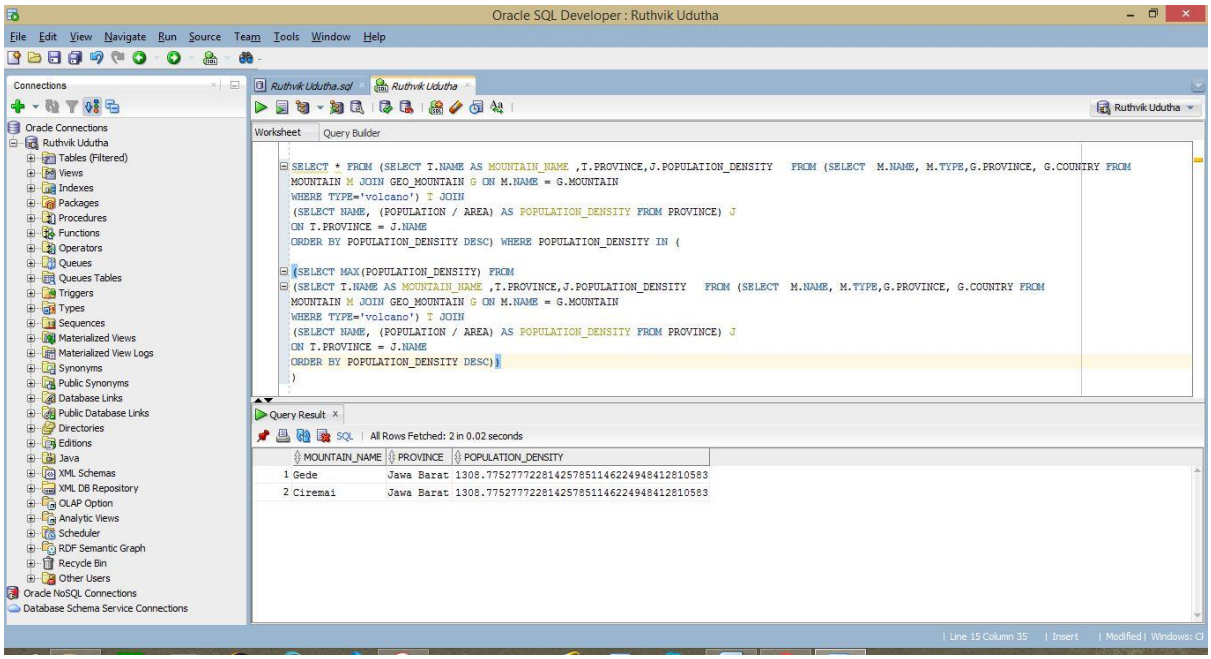


8.

```
SELECT
  *
FROM
  (
    SELECT
      t.name AS mountain_name,
      t.province,
      j.population_density
    FROM
      (
        SELECT
          m.name,
          m.type,
          g.province,
          g.country
        FROM
          mountain      m
          JOIN geo_mountain   g ON m.name = g.mountain
```

```
            WHERE
                type = 'volcano'
        ) t
        JOIN (
            SELECT
                name,
                ( population / area ) AS population_density
            FROM
                province
        ) j ON t.province = j.name
    ORDER BY
        population_density DESC
)
WHERE
    population_density IN (
        (
            SELECT
                MAX(population_density)
            FROM
                (
                    SELECT
                        t.name AS mountain_name,
                        t.province,
                        j.population_density
                    FROM
                        (
                            SELECT
                                m.name,
                                m.type,
                                g.province,
                                g.country
                            FROM
                                mountain      m
```

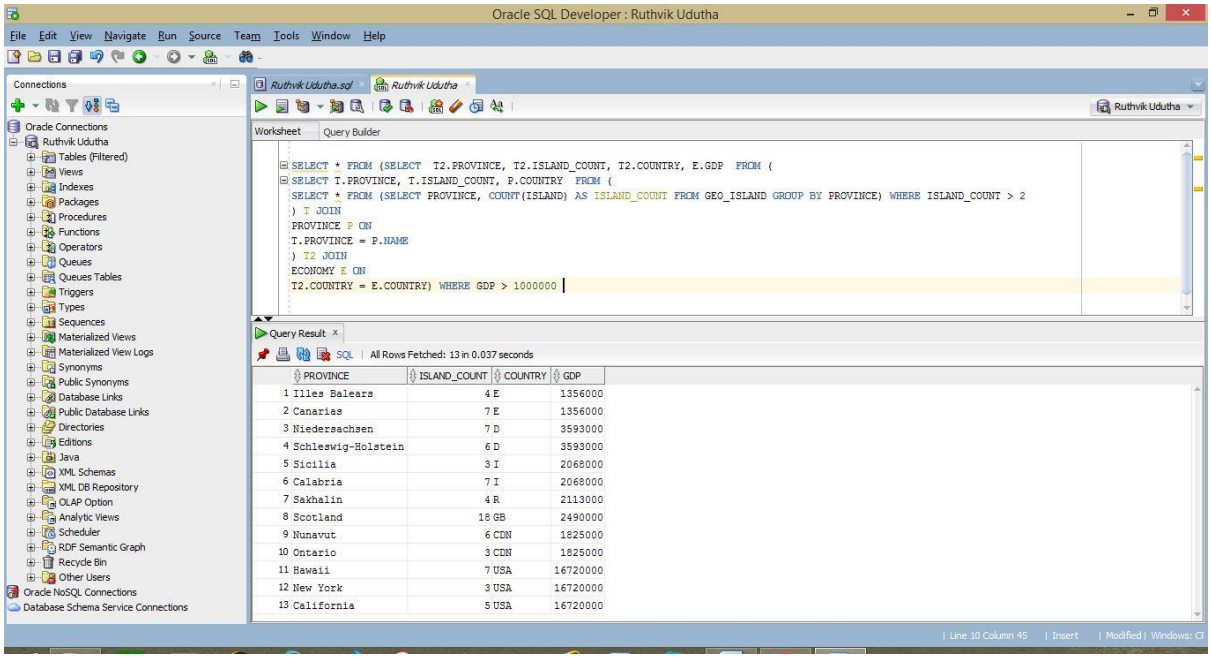
```
            JOIN geo_mountain   g ON m.name = g.mountain
          WHERE
            type = 'volcano'
        ) t
        JOIN (
          SELECT
            name,
            ( population / area ) AS population_density
          FROM
            province
        ) j ON t.province = j.name
      ORDER BY
        population_density DESC
    )
  )
)
```



9.

```
SELECT
  *
FROM
  (
    SELECT
      t2.province,
      t2.island_count,
      t2.country,
      e.gdp
    FROM
      (
        SELECT
          t.province,
          t.island_count,
          p.country
        FROM
          (
            SELECT
              *
            FROM
              (
                SELECT
                  province,
                  COUNT(island) AS island_count
                FROM
                  geo_island
                GROUP BY
                  province
              )
            WHERE
              island_count > 2
          ) t
```

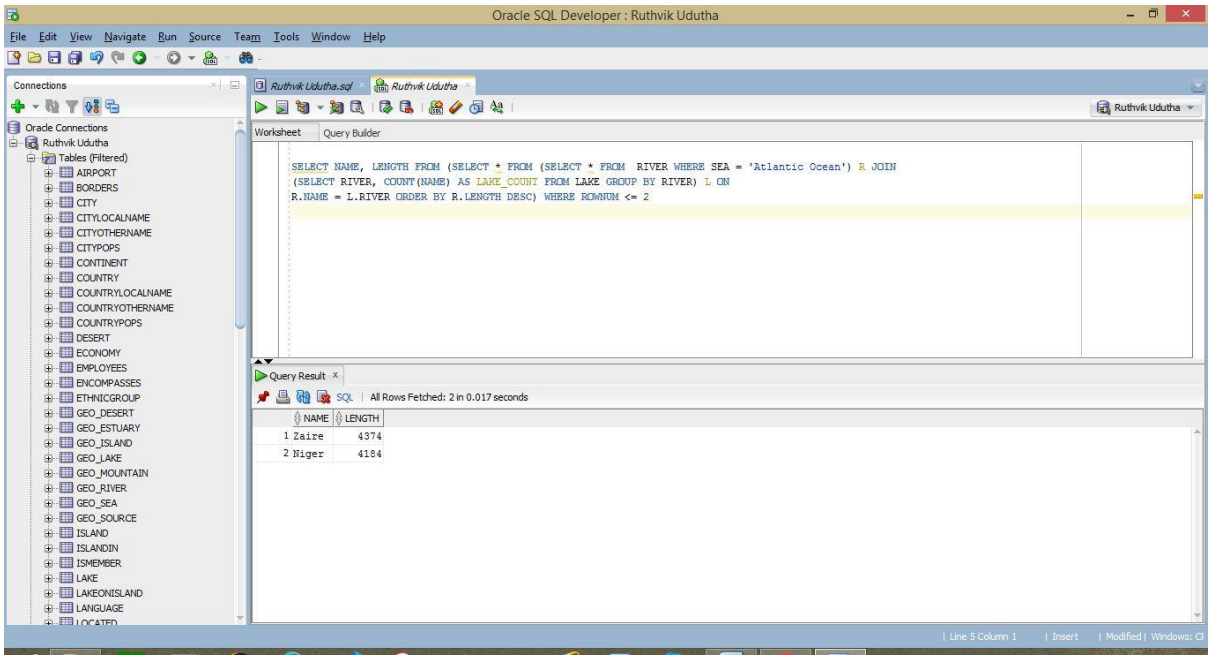
```
        JOIN province p ON t.province = p.name
    ) t2
    JOIN economy e ON t2.country = e.country
)
WHERE
  gdp > 1000000
```



10.

```
SELECT
  name,
  length
FROM
  (
    SELECT
      *
    FROM
      (
        SELECT
          *
        FROM
          river
```

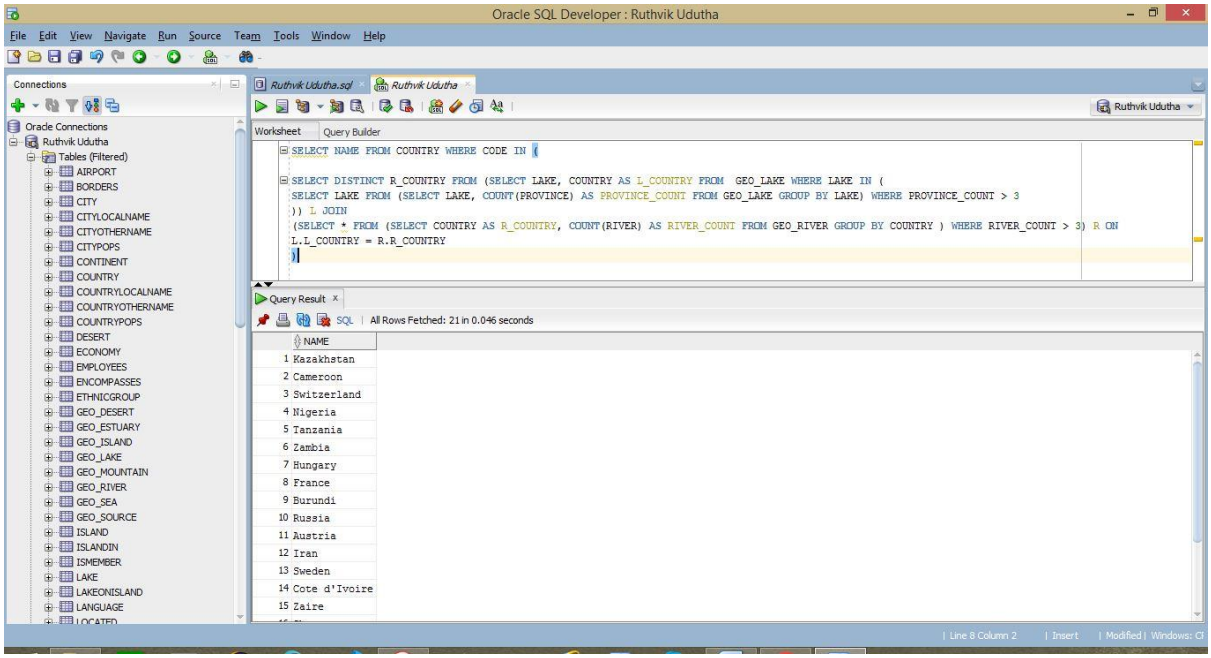
```
            WHERE
                sea = 'Atlantic Ocean'
        )       r
        JOIN (
            SELECT
                river,
                COUNT(name) AS lake_count
            FROM
                lake
            GROUP BY
                river
        ) l ON r.name = l.river
    ORDER BY
        r.length DESC
)
WHERE
    ROWNUM <= 2
```



11.

```
SELECT
  name
FROM
  country
WHERE
  code IN (
    SELECT DISTINCT
      r_country
    FROM
      (
        SELECT
          lake,
          country AS l_country
        FROM
          geo_lake
        WHERE
          lake IN (
            SELECT
              lake
            FROM
              (
                SELECT
                  lake,
                  COUNT(province) AS province_count
                FROM
                  geo_lake
                GROUP BY
                  lake
              )
            WHERE
              province_count > 3
```

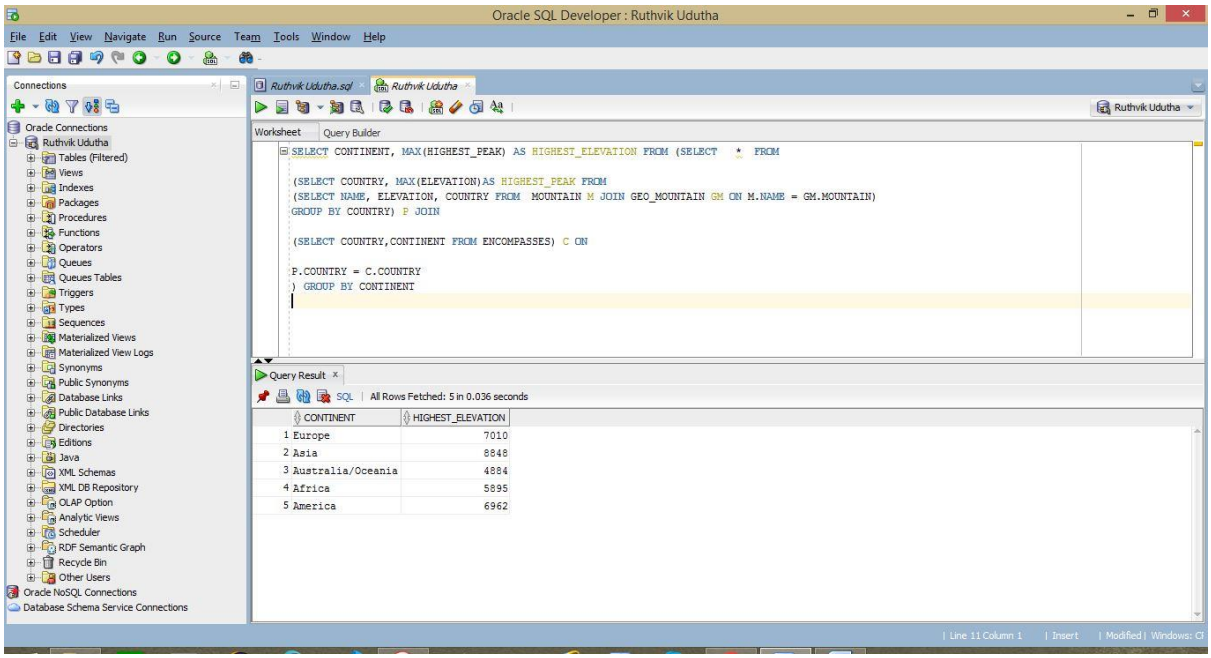
```
        )
    ) l
    JOIN (
      SELECT
        *
      FROM
        (
          SELECT
            country AS r_country,
            COUNT(river) AS river_count
          FROM
            geo_river
          GROUP BY
            country
        )
      WHERE
        river_count > 3
    ) r ON l.l_country = r.r_country
)
```



13.

```
SELECT
  continent,
  MAX(highest_peak) AS highest_elevation
FROM
  (
    SELECT
      *
    FROM
      (
        SELECT
          country,
          MAX(elevation) AS highest_peak
        FROM
          (
            SELECT
              name,
              elevation,
              country
            FROM
              mountain      m
              JOIN geo_mountain   gm ON m.name = gm.mountain
          )
        GROUP BY
          country
      ) p
      JOIN (
        SELECT
          country,
          continent
        FROM
          encompasses
      ) c ON p.country = c.country
```

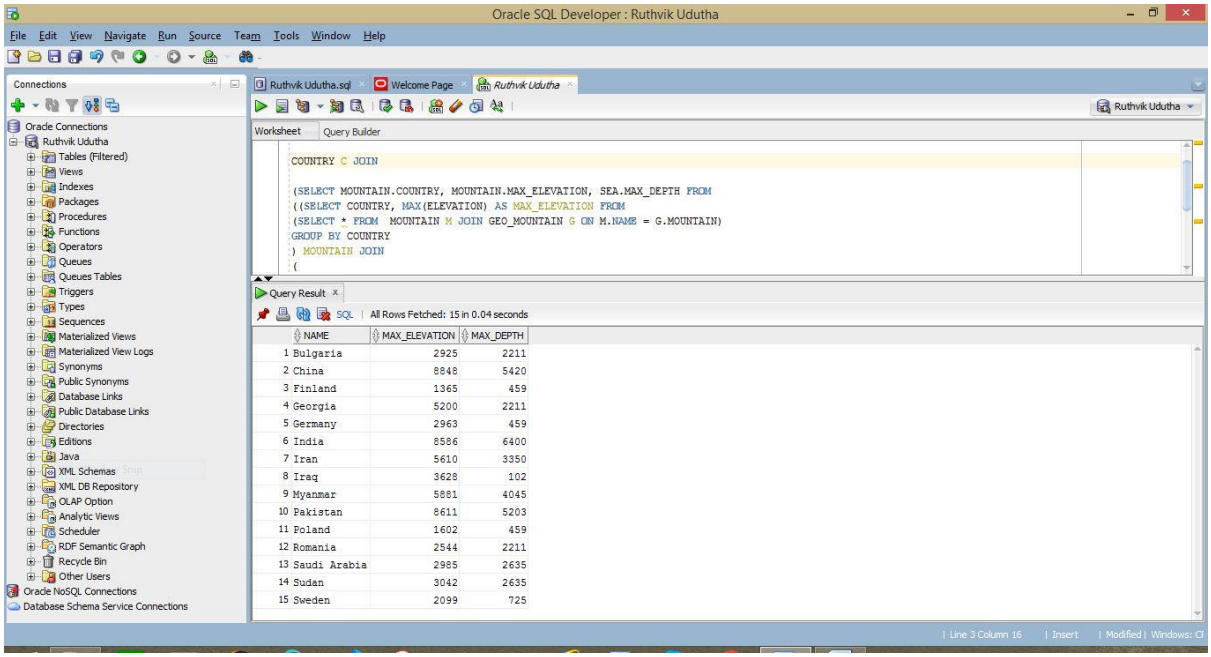
```
)
GROUP BY
    continent
```



14.

```
SELECT
    c.name,
    temp.max_elevation,
    temp.max_depth
FROM
    country c
    JOIN (
        SELECT
            mountain.country,
            mountain.max_elevation,
            sea.max_depth
        FROM
            ( (
                SELECT
                    country,
```

```
            MAX(elevation) AS max_elevation
        FROM
            (
                SELECT
                    *
                FROM
                    mountain       m
                    JOIN geo_mountain   g ON m.name = g.mountain
            )
        GROUP BY
            country
    ) mountain
    JOIN (
        SELECT
            country,
            MAX(depth) AS max_depth
        FROM
            (
                SELECT
                    *
                FROM
                    sea      s
                    JOIN geo_sea   gs ON s.name = gs.sea
            )
        GROUP BY
            country
    ) sea ON mountain.country = sea.country )
  WHERE
    mountain.max_elevation > sea.max_depth
) temp ON c.code = temp.country
```

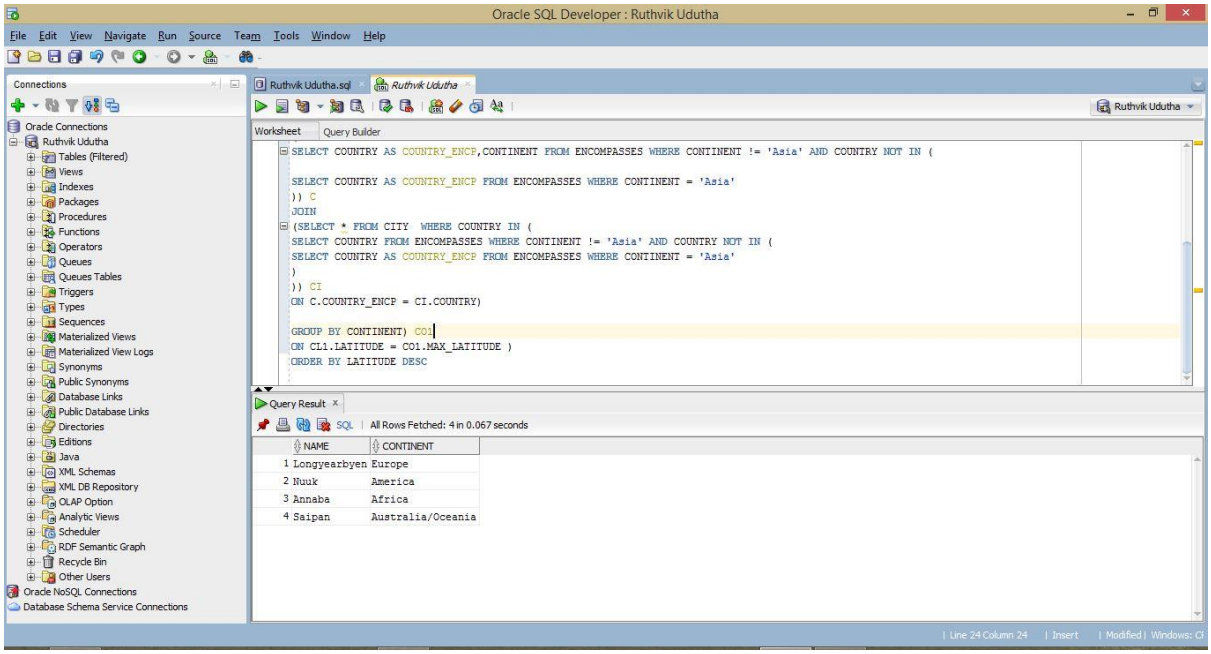


15.

```
SELECT
   name,
   continent
FROM
   (
      SELECT
         cl1.name,
         cl1.latitude,
         co1.continent
      FROM
         (
            SELECT
               name,
               latitude
            FROM
               city
            WHERE
               country NOT IN (
                  SELECT
```

```
            country AS country_encp
        FROM
            encompasses
        WHERE
            continent = 'Asia'
    )
) cl1
JOIN (
    SELECT
        continent,
        MAX(latitude) AS max_latitude
    FROM
        (
            SELECT
                ci.country,
                ci.name AS city_name,
                c.continent,
                ci.latitude
            FROM
                (
                    SELECT
                        country AS country_encp,
                        continent
                    FROM
                        encompasses
                    WHERE
                        continent != 'Asia'
                        AND country NOT IN (
                            SELECT
                                country AS country_encp
                            FROM
                                encompasses
                            WHERE
```

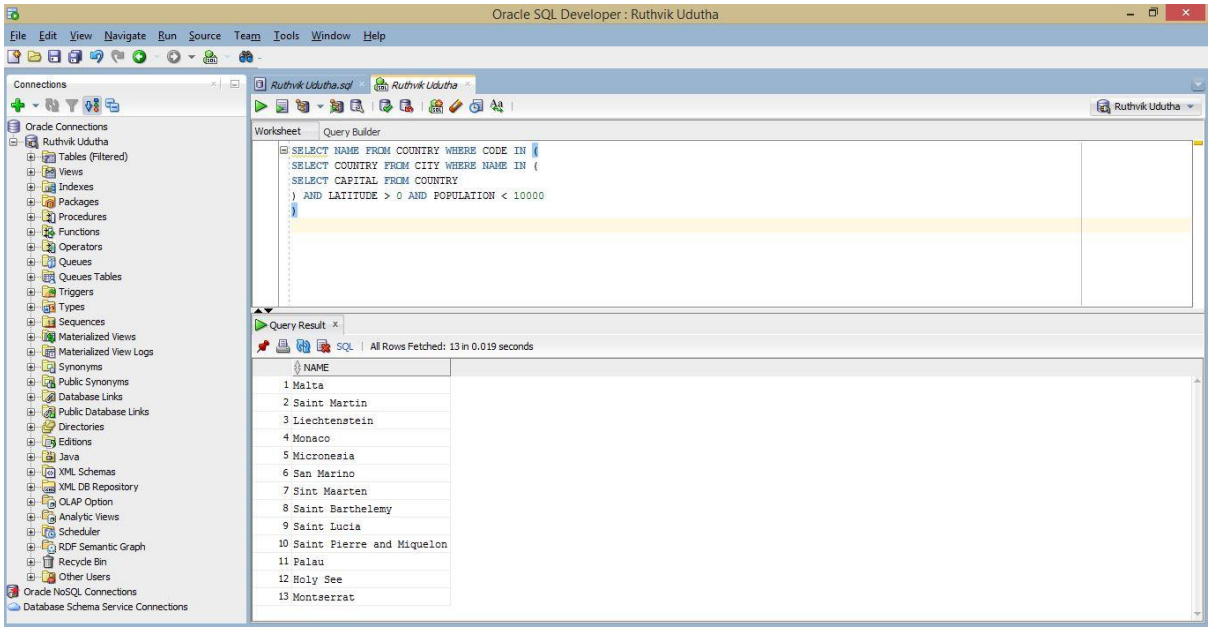
```
                    continent = 'Asia'
                )
            ) c
            JOIN (
              SELECT
                *
              FROM
                city
              WHERE
                country IN (
                  SELECT
                    country
                  FROM
                    encompasses
                  WHERE
                    continent != 'Asia'
                    AND country NOT IN (
                      SELECT
                        country AS country_encp
                      FROM
                        encompasses
                      WHERE
                        continent = 'Asia'
                    )
                )
            ) ci ON c.country_encp = ci.country
        )
      GROUP BY
        continent
    ) co1 ON cl1.latitude = co1.max_latitude
  )
ORDER BY
  latitude DESC
```



16.

```
SELECT
   name
FROM
   country
WHERE
   code IN (
      SELECT
         country
      FROM
         city
      WHERE
         name IN (
            SELECT
               capital
            FROM
               country
         )
         AND latitude > 0
         AND population < 10000
```

)



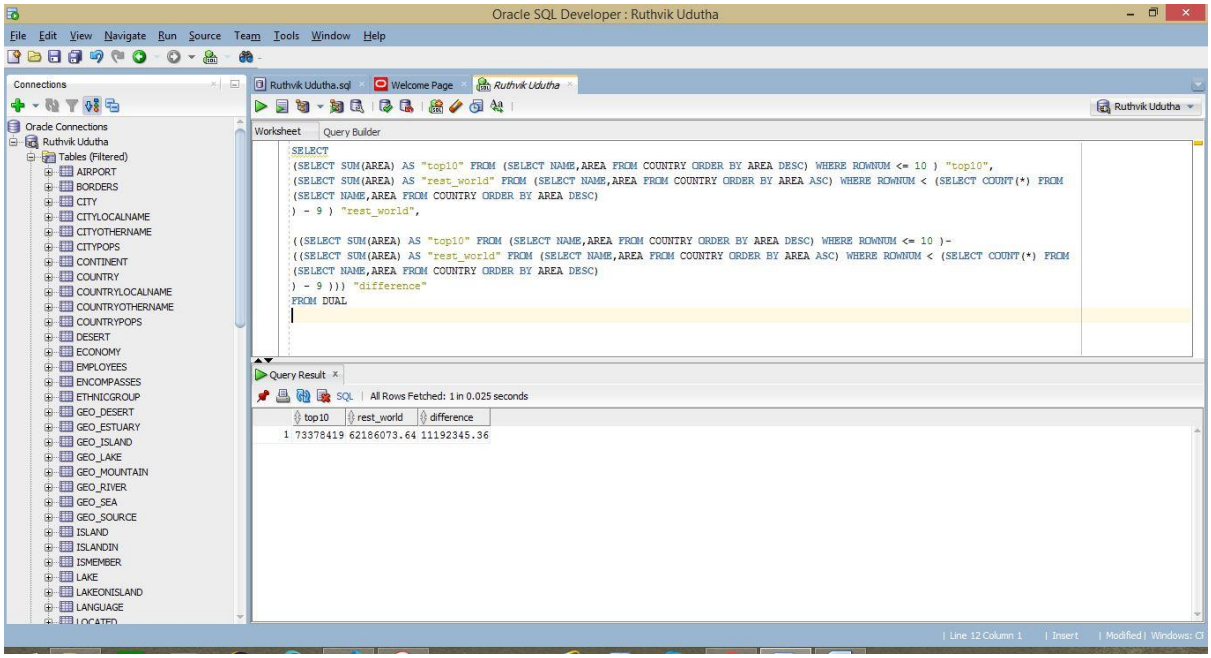
17.

```
SELECT
  (
    SELECT
      SUM(area) AS "top10"
    FROM
      (
        SELECT
          name,
          area
        FROM
          country
        ORDER BY
          area DESC
      )
    WHERE
      ROWNUM <= 10
  ) "top10",
  (
```

```
  SELECT
    SUM(area) AS "rest_world"
  FROM
    (
      SELECT
        name,
        area
      FROM
        country
      ORDER BY
        area ASC
    )
  WHERE
    ROWNUM < (
      SELECT
        COUNT(*)
      FROM
        (
          SELECT
            name,
            area
          FROM
            country
          ORDER BY
            area DESC
        )
    ) - 9
) "rest_world",
( (
  SELECT
    SUM(area) AS "top10"
  FROM
    (
```

```
        SELECT
          name,
          area
        FROM
          country
        ORDER BY
          area DESC
      )
    WHERE
      ROWNUM <= 10
) - ( (
    SELECT
      SUM(area) AS "rest_world"
    FROM
      (
        SELECT
          name,
          area
        FROM
          country
        ORDER BY
          area ASC
      )
    WHERE
      ROWNUM < (
        SELECT
          COUNT(*)
        FROM
          (
            SELECT
              name,
              area
            FROM
```

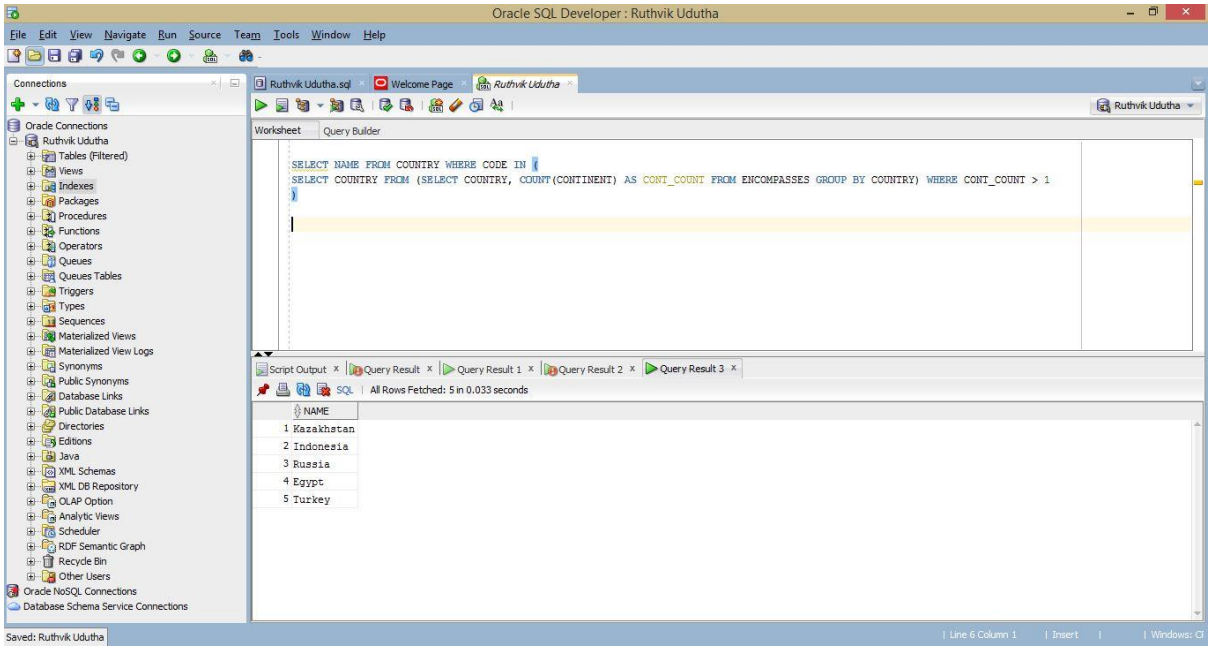
```
                country
            ORDER BY
                area DESC
        )
    ) - 9
) ) ) "difference"
FROM
    dual
```



18.

```
SELECT
    name
FROM
    country
WHERE
    code IN (
        SELECT
            country
```

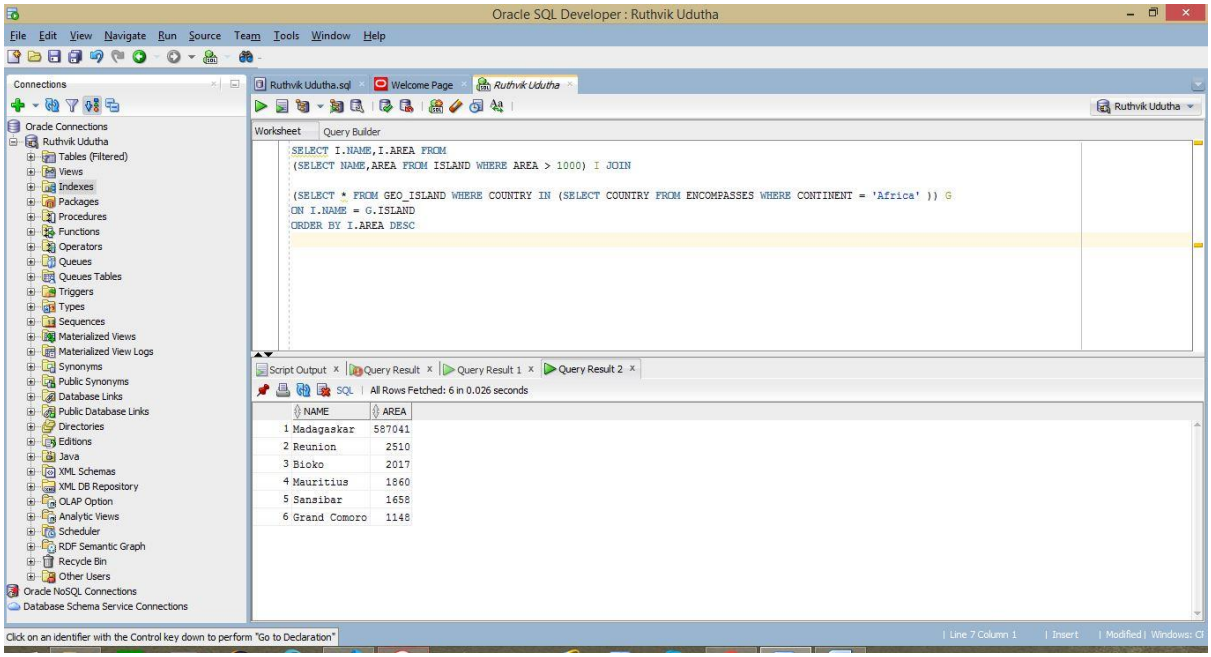
```
    FROM
      (
        SELECT
          country,
          COUNT(continent) AS cont_count
        FROM
          encompasses
        GROUP BY
          country
      )
    WHERE
      cont_count > 1
  )
```



19.

```
SELECT
  i.name,
  i.area
FROM
  (
    SELECT
```

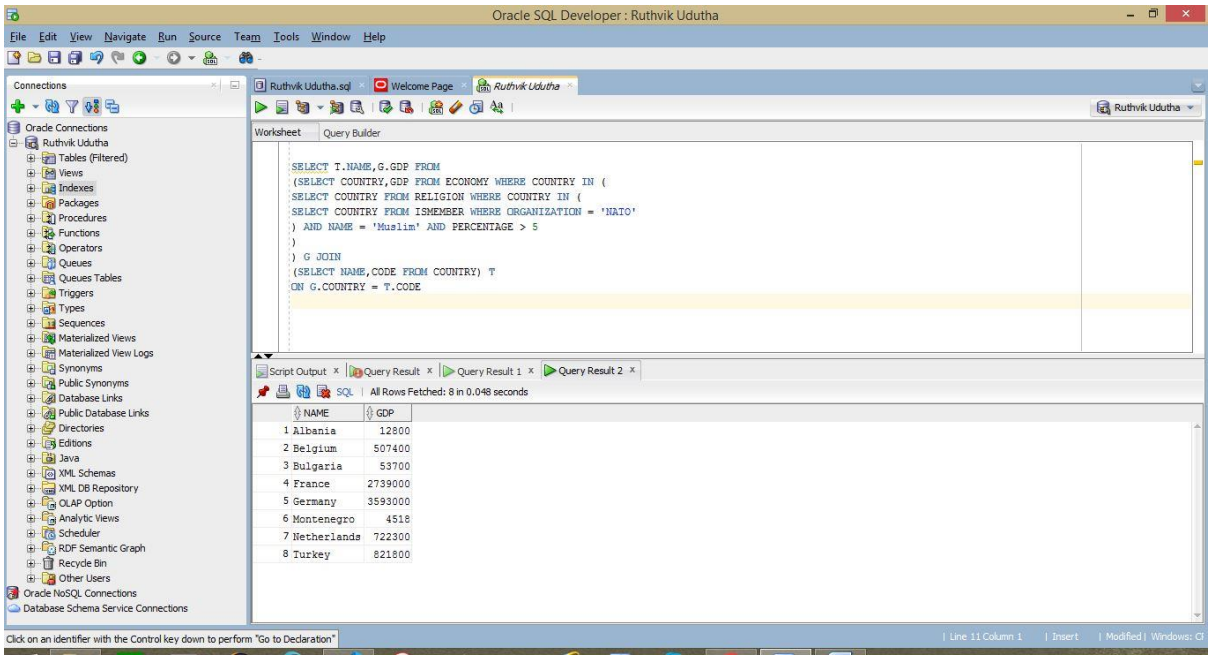
```
        name,
        area
      FROM
        island
      WHERE
        area > 1000
    )                                   i
    JOIN (
      SELECT
        *
      FROM
        geo_island
      WHERE
        country IN (
          SELECT
            country
          FROM
            encompasses
          WHERE
            continent = 'Africa'
        )
    ) g ON i.name = g.island
ORDER BY
    i.area DESC
```



20.

```
SELECT
   t.name,
   g.gdp
FROM
   (
      SELECT
         country,
         gdp
      FROM
         economy
      WHERE
         country IN (
            SELECT
               country
            FROM
               religion
            WHERE
               country IN (
                  SELECT
```

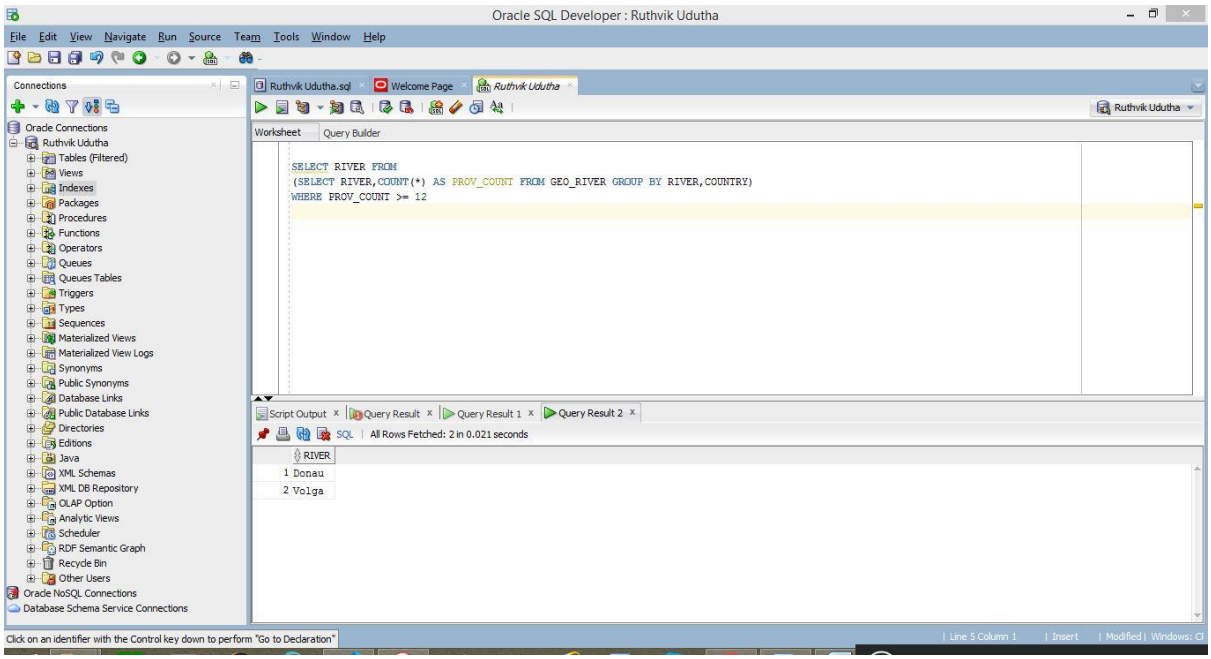
```
            country
        FROM
            ismember
        WHERE
            organization = 'NATO'
    )
    AND name = 'Muslim'
    AND percentage > 5
  )
) g
JOIN (
  SELECT
    name,
    code
  FROM
    country
) t ON g.country = t.code
```



21.

```
SELECT
```

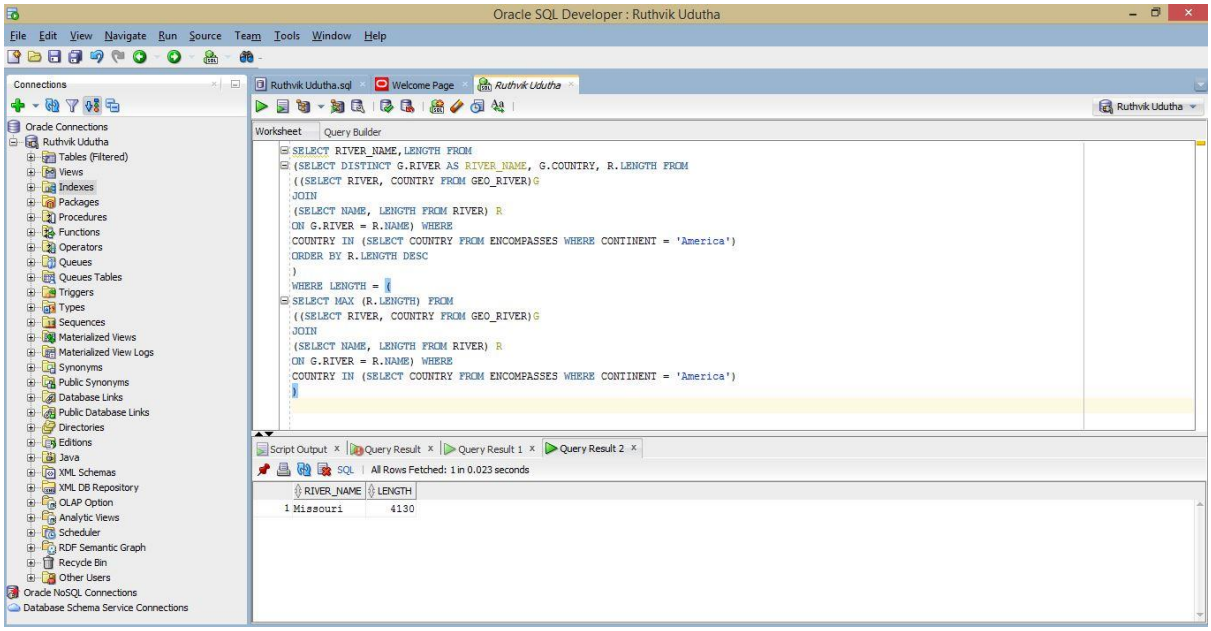
```
  river
FROM
  (
    SELECT
      river,
      COUNT(*) AS prov_count
    FROM
      geo_river
    GROUP BY
      river,
      country
  )
WHERE
  prov_count >= 12
```



22.

```
SELECT
  river_name,
  length
FROM
  (
    SELECT DISTINCT
      g.river AS river_name,
      g.country,
      r.length
    FROM
      ( (
        SELECT
          river,
          country
        FROM
          geo_river
      ) g
      JOIN (
        SELECT
          name,
          length
        FROM
          river
      )    r ON g.river = r.name )
    WHERE
      country IN (
        SELECT
          country
        FROM
          encompasses
        WHERE
          continent = 'America'
```

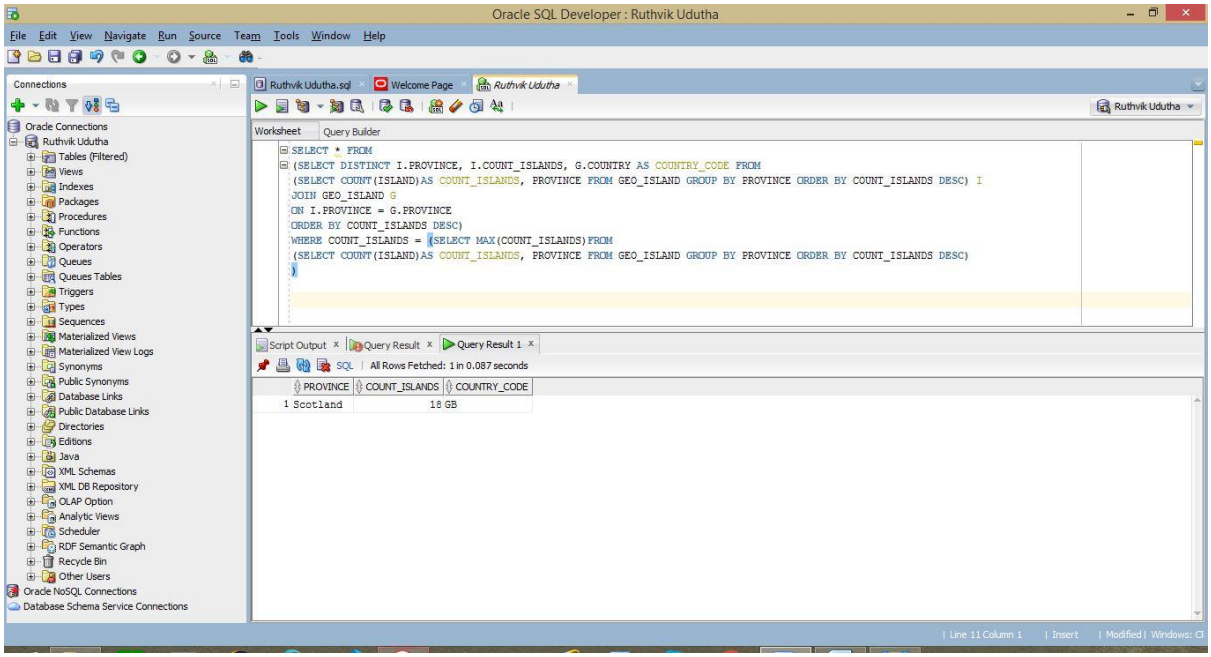
```
        )
    ORDER BY
        r.length DESC
  )
WHERE
  length = (
    SELECT
      MAX(r.length)
    FROM
      ( (
        SELECT
          river,
          country
        FROM
          geo_river
      ) g
      JOIN (
        SELECT
          name,
          length
        FROM
          river
      )    r ON g.river = r.name )
    WHERE
      country IN (
        SELECT
          country
        FROM
          encompasses
        WHERE
          continent = 'America'
      )
  )
```



23.

```
SELECT
  *
FROM
  (
    SELECT DISTINCT
      i.province,
      i.count_islands,
      g.country AS country_code
    FROM
      (
        SELECT
          COUNT(island) AS count_islands,
          province
        FROM
          geo_island
        GROUP BY
          province
        ORDER BY
          count_islands DESC
```

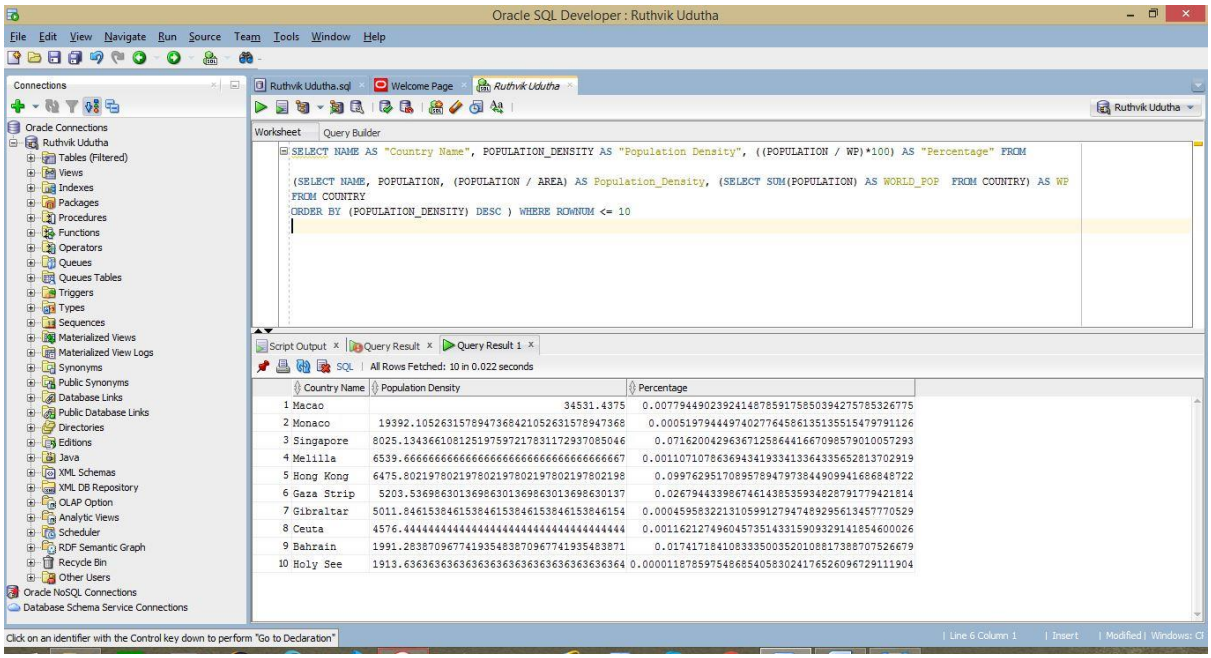
```
        ) i
        JOIN geo_island     g
      ON i.province = g.province
      ORDER BY
        count_islands DESC
  )
WHERE
  count_islands = (
    SELECT
      MAX(count_islands)
    FROM
      (
        SELECT
          COUNT(island) AS count_islands,
          province
        FROM
          geo_island
        GROUP BY
          province
        ORDER BY
          count_islands DESC
      )
  )
```



24.

```
SELECT
   name    AS "Country Name",
   population_density   AS "Population Density",
   ( ( population / wp ) * 100 ) AS "Percentage"
FROM
   (
      SELECT
         name,
         population,
         ( population / area ) AS population_density,
         (
            SELECT
               SUM(population) AS world_pop
            FROM
               country
         ) AS wp
      FROM
         country
      ORDER BY
```

```
        ( population_density ) DESC
    )
WHERE
    ROWNUM <= 10
```



25.

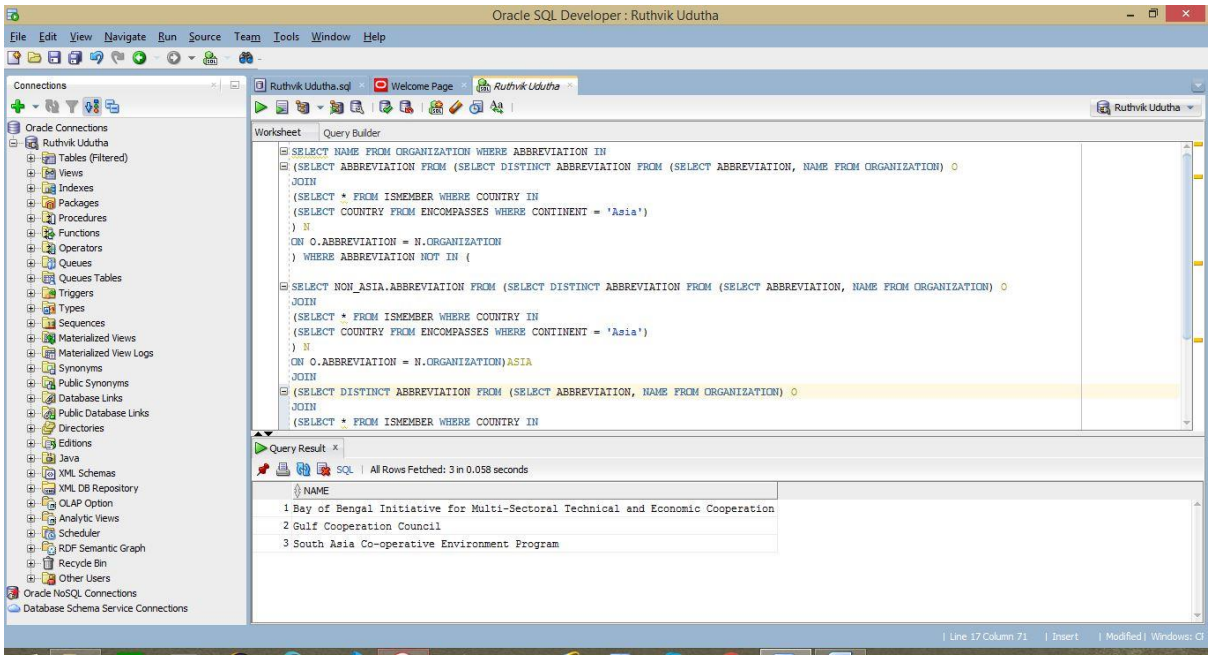
```
SELECT
    name
FROM
    organization
WHERE
    abbreviation IN (
        SELECT
            abbreviation
        FROM
            (
                SELECT DISTINCT
                    abbreviation
                FROM
                    (
                        SELECT
```

```
            abbreviation,
            name
        FROM
            organization
    ) o
    JOIN (
        SELECT
            *
        FROM
            ismember
        WHERE
            country IN (
                SELECT
                    country
                FROM
                    encompasses
                WHERE
                    continent = 'Asia'
            )
    ) n ON o.abbreviation = n.organization
)
WHERE
    abbreviation NOT IN (
        SELECT
            non_asia.abbreviation
        FROM
            (
                SELECT DISTINCT
                    abbreviation
                FROM
                    (
                        SELECT
                            abbreviation,
```

```
            name
        FROM
            organization
    ) o
    JOIN (
        SELECT
            *
        FROM
            ismember
        WHERE
            country IN (
                SELECT
                    country
                FROM
                    encompasses
                WHERE
                    continent = 'Asia'
            )
    ) n ON o.abbreviation = n.organization
) asia
JOIN (
    SELECT DISTINCT
        abbreviation
    FROM
        (
            SELECT
                abbreviation,
                name
            FROM
                organization
        ) o
        JOIN (
            SELECT
```

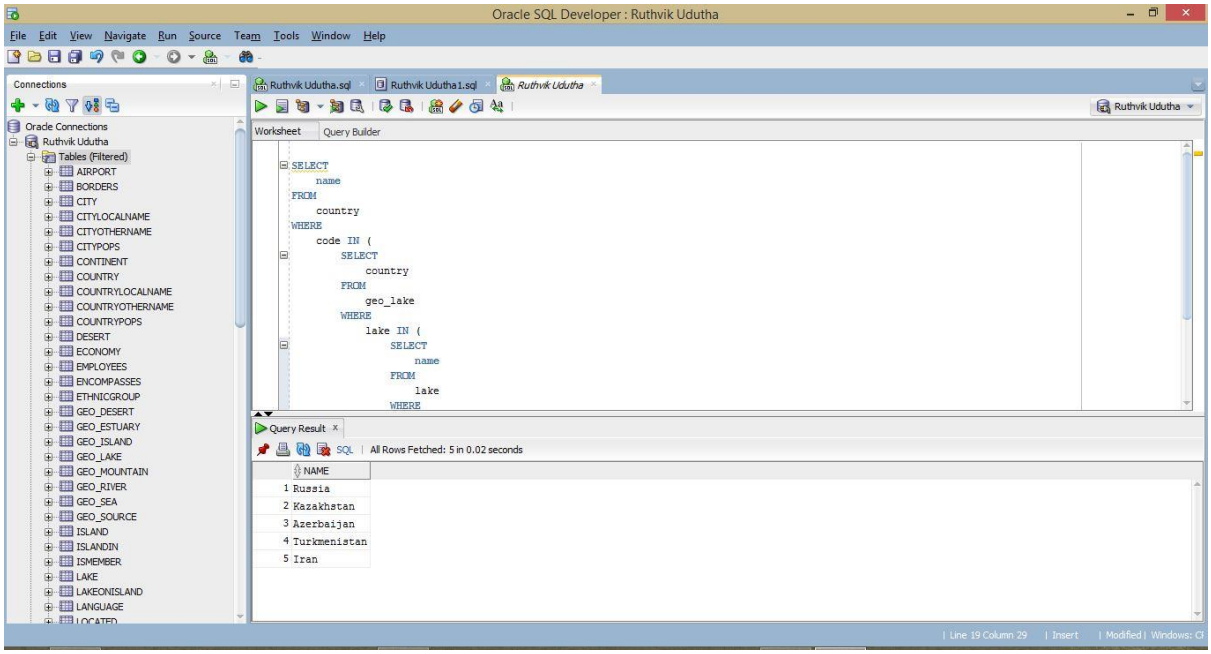
```
      *
    FROM
      ismember
    WHERE
      country IN (
        SELECT
          country
        FROM
          encompasses
        WHERE
          continent != 'Asia'
      )
  ) n ON o.abbreviation = n.organization
) non_asia ON asia.abbreviation = non_asia.abbreviation
)
)
```

--NAME OF ORGANIZATONS HAVING ASIAN MEMBER COUNTRIES



12.

```
SELECT
  name
FROM
  country
WHERE
  code IN (
    SELECT
      country
    FROM
      geo_lake
    WHERE
      lake IN (
        SELECT
          name
        FROM
          lake
        WHERE
          area = (
            SELECT
              MAX(area)
            FROM
              lake
          )
      )
  )
```



Exercise 2 (QBE)

1.

Drivers	did	dname	gender	age
	_i	P._n		

Reserve	did	cid	day	cost
	_i	_c	02/14/2017	

Cars	cid	cname	model	color	rid
	_c		Chevrolet	red	

2.

RentalCompay	rid	rname	revenue	rating
	_r			>6.5

IsMember	did	rid	join_time	member_type
	_d	_r		

Drivers	did	dname	gender	age
	_d	P._n		

3.

RentalCompay	rid	rname	revenue	rating
	_r	_rn		

Conditions
_rn = (Avis AND Hertz)

IsMember	did	rid	join_time	member_type
	_i	_r		

Drivers	did	dname	gender	age
	_i	P._n		_a
not	_m			< _a

4.

Drivers	did	dname	gender	age
	_d			

Reserve	did	cid	day	cost
	_d	_c		>2000

RentalCompay	rid	rname	revenue	rating
	_r	Avis		

IsMember	did	rid	join_time	member_type
	_d	_r		U.VIP

5.

RentalCompay	rid	rname	revenue	rating
	_r	P.G.		

IsMember	did	rid	join_time	member_type
	MAX.CNT.UN.ALL_y	_r		

6.

Drivers	did	dname	gender	age
	_d			_a

Condition
_a=(>21 and < 30)

Reserve	did	cid	day	cost
	_d	_c		

Cars	cid	cname	model	color	rid
	_c		P.G.		_r

RentalCompany	rid	rnane	revenue	rating	
	MAX.CNT.ALL._R				