1. Queries using IN and NOT IN

b) What are the names and addresses of clients who have a bank account but no loans?

```
SELECT customer_name, customer_street, customer_city
FROM customer
WHERE customer_name IN (
    SELECT customer_name
    FROM depositor)
AND customer_name NOT IN (
    SELECT customer_name
    FROM borrower);
+-------------+---------------+-------------+
|customer_name|customer_street|customer_city|
+-------------+---------------+-------------+
|Evans        |Forest Street  |Coimbra      |
|Flores       |Station Street |Braga        |
|Johnson      |New Street     |Cascais      |
|Oliver       |First Street   |Oporto       |
+-------------+---------------+-------------+
```

---

2. Simple aggregation queries

c) How many clients live in the same city of a branch where they have an account?

```
SELECT COUNT(DISTINCT c.customer_name)
FROM branch b
  JOIN account a ON a.branch_name = b.branch_name
  JOIN depositor d ON a.account_number = d.account_number
  JOIN customer c ON c.customer_name = d.customer_name
WHERE c.customer_city = b.branch_city;
+-----+
|count|
+-----+
|1    |
+-----+
```

---

3. Queries using GROUP BY

g) List, alphabetically, the names of customers who have more than two bank accounts.

```
SELECT DISTINCT customer_name
FROM depositor
GROUP BY customer_name
HAVING COUNT(account_number) > 2
ORDER BY customer_name ASC;
```

(empty result)

4. Nested/Correlated Queries

c) What are the branch names and the difference between the total balance of their accounts and the total amount of their loans?

```
SELECT b.branch_name, total_assets - total_liabilities
FROM branch b
      INNER JOIN (SELECT branch_name, SUM(balance) as total_assets
                        FROM account
                        GROUP BY branch_name) a
                  ON a.branch_name = b.branch_name
      INNER JOIN (SELECT branch_name, SUM(amount) as total_liabilities
                        FROM loan
                        GROUP BY branch_name) l
                  ON l.branch_name = b.branch_name;
+-----------+--------+
|branch_name|?column?|
+-----------+--------+
|Downtown   |-11650  |
|Central    |-9700   |
|Uptown     |-8400   |
|Metro      |-4400   |
|Round Hill |-5200   |
+-----------+--------+
```

d) For each customer, what are their names, total in loans and total in balances?

```
SELECT c.customer_name,
  (SELECT SUM(amount)
   FROM loan
        JOIN borrower ON loan.loan_number = borrower.loan_number
   WHERE borrower.customer_name = c.customer_name) AS total_loans,
  (SELECT SUM(balance)
   FROM account
        JOIN depositor ON account.account_number = depositor.account_number
   WHERE depositor.customer_name = c.customer_name) AS total_accounts
FROM customer c;
+-------------+-----------+--------------+
|customer_name|total_loans|total_accounts|
+-------------+-----------+--------------+
|Adams        |NULL       |NULL          |
|Brown        |17000      |1450          |
|Cook         |3000       |1200          |
|Davis        |5000       |NULL          |
|Evans        |NULL       |550           |
|Flores       |NULL       |800           |
|Gonzalez     |1000       |NULL          |
|Iacocca      |8000       |650           |
|Johnson      |NULL       |1400          |
|King         |NULL       |NULL          |
|Lopez        |NULL       |NULL          |
|Martin       |NULL       |NULL          |
|Nguyen       |4000       |NULL          |
|Oliver       |NULL       |750           |
|Parker       |8000       |NULL          |
+-------------+-----------+--------------+
```

5. Queries to determine the distinctive element

e) Which branch city has the most customers (considering all its branches)?

```
SELECT branch_city, COUNT(DISTINCT customer_name)
FROM (
    SELECT customer_name, branch_city
    FROM depositor d
      INNER JOIN account a ON d.account_number = a.account_number
      INNER JOIN branch b ON b.branch_name = a.branch_name
    UNION
      SELECT customer_name, branch_city
    FROM borrower b
      INNER JOIN loan l ON l.loan_number = b.loan_number
      INNER JOIN branch c ON c.branch_name = l.branch_name
    ) AS customer_contracts
GROUP BY branch_city
HAVING COUNT(DISTINCT customer_name) >= ALL (
      SELECT COUNT(DISTINCT customer_name)
      FROM (
          SELECT customer_name, branch_city
            FROM depositor d
                  INNER JOIN account a ON d.account_number = a.account_number
                  INNER JOIN branch b ON b.branch_name = a.branch_name
            UNION
            SELECT customer_name, branch_city
            FROM borrower b
                  INNER JOIN loan l ON l.loan_number = b.loan_number
                  INNER JOIN branch c ON c.branch_name = l.branch_name
            ) AS customer_contracts
      GROUP BY branch_city
);
+-----------+-----+
|branch_city|count|
+-----------+-----+
|Lisbon     |7    |
+-----------+-----+
```

f) What is the name and address of the customer who has the greatest total balance?

```
SELECT customer_name, customer_city, customer_street
FROM customer
WHERE customer_name IN (
      SELECT customer_name
      FROM depositor d INNER JOIN account a
                  ON a.account_number = d.account_number
      GROUP BY customer_name
      HAVING SUM(balance) >= ALL
            (SELECT SUM(balance)
            FROM depositor d INNER JOIN account a
                  ON a.account_number = d.account_number
              GROUP BY customer_name));
+-------------+-------------+---------------+
|customer_name|customer_city|customer_street|
+-------------+-------------+---------------+
|Brown        |Oporto       |Main Street    |
+-------------+-------------+---------------+
```

6. Queries with UNIQUE and EXISTS

d) Which branches have an account with more than one owner?

```
SELECT branch_name
FROM branch b
WHERE EXISTS(
        SELECT *
            FROM account a
            WHERE a.branch_name = b.branch_name
              AND 1 < (SELECT COUNT(*)
                           FROM depositor d
                           WHERE d.account_number = a.account_number)
            );
+-----------+
|branch_name|
+-----------+
|Downtown   |
+-----------+
```

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7. Queries with OUTER JOIN

b) List all customer names and cities along with their highest loan, and biggest account, if they exist.

```
SELECT c.customer_name, c.customer_street, max_loan.loan_number,
max_account.account_number
FROM customer c
    LEFT OUTER JOIN (
            SELECT customer_name, loan_number
            FROM borrower b NATURAL JOIN loan l
            WHERE l.amount = (
                    SELECT MAX(amount)
                    FROM borrower natural JOIN loan
                    WHERE customer_name = b.customer_name)
    ) max_loan ON max_loan.customer_name = c.customer_name
    LEFT OUTER JOIN (
        SELECT customer_name, account_number
            FROM depositor d NATURAL JOIN account a
            WHERE a.balance = (
                    SELECT MAX(balance)
                    FROM depositor NATURAL JOIN account
                    WHERE customer_name = d.customer_name)
    ) max_account ON max_account.customer_name = c.customer_name;
+-------------+--------------+-----------+--------------+
|customer_name|customer_street|loan_number|account_number|
+-------------+--------------+-----------+--------------+
|Adams        |Main Street    |NULL       |NULL          |
|Brown        |Main Street    |L-21       |A-444         |
|Cook         |Main Street    |L-15       |A-102         |
|Davis        |Church Street  |L-93       |NULL          |
|Evans        |Forest Street  |NULL       |A-222         |
|Flores       |Station Street |NULL       |A-305         |
|Gonzalez     |Sunny Street   |L-17       |NULL          |
```

```
|Iacocca      |Spring Steet   |L-16       |A-217          |
|Johnson      |New Street     |NULL       |A-201          |
|King         |Garden Street  |NULL       |NULL           |
|Lopez        |Grand Street   |NULL       |NULL           |
|Martin       |Royal Street   |NULL       |NULL           |
|Nguyen       |School Street  |L-14       |NULL           |
|Oliver       |First Street   |NULL       |A-333          |
|Parker       |Liberty Avenue |L-20       |NULL           |
+-------------+---------------+-----------+---------------+
```

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8. Queries that test for coverage (Division)

c) Who are the clients who have accounts at all branches in the same city where they live?

```
SELECT DISTINCT c.customer_name
FROM depositor d JOIN customer c
      ON d.customer_name = c.customer_name
WHERE NOT EXISTS (
      SELECT branch_name
      FROM branch
      WHERE branch_city = c.customer_city
      EXCEPT
      SELECT branch_name
      FROM depositor d JOIN account a
            ON d.account_number = a.account_number
      WHERE d.customer_name = c.customer_name);
+-------------+
|customer_name|
+-------------+
|Cook         |
|Evans        |
|Flores       |
|Iacocca      |
+-------------+
```