



LAB REPORT

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SUBMITTED TO

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Database Systems Lab

Prerequisites

Creating a new database:

```
CREATE DATABASE bank_408;
```

Creating six tables: `account` , `branch` , `depositor` , `customer` , `loan` and `borrower`

```
CREATE TABLE account (account_number char(5), branch_name  
varchar(32), balance int(7));  
CREATE TABLE branch (branch_name varchar(32), branch_city  
varchar(32), assets int(8));  
CREATE TABLE depositor (customer_name varchar(32),  
account_number char(5));  
CREATE TABLE customer (customer_name varchar(32),  
customer_street varchar(32), customer_city varchar(32));  
CREATE TABLE loan (loan_number char(5), branch_name  
varchar(32), amount int(8));  
CREATE TABLE borrower (customer_name varchar(32),  
loan_number char(8));
```

Inserting data to the tables:

```
-- Inserting data into `account`  
INSERT INTO account VALUES("A-101", "Downtown", 500);  
INSERT INTO account VALUES("A-102", "Perryridge", 400);  
INSERT INTO account VALUES("A-201", "Brighton", 900);  
INSERT INTO account VALUES("A-215", "Mianus", 700);
```

```

INSERT INTO account VALUES("A-217", "Brighton", 750);
INSERT INTO account VALUES("A-222", "Redwood", 700);
INSERT INTO account VALUES("A-305", "Round Hill", 350);

-- Inserting data into `branch`
INSERT INTO branch VALUES("Brighton", "Brooklyn", 7100000);
INSERT INTO branch VALUES("Downtown", "Brooklyn", 9000000);
INSERT INTO branch VALUES("Mianus", "Horseneck", 400000);
INSERT INTO branch VALUES("North Town", "Rye", 3700000);
INSERT INTO branch VALUES("Perryridge", "Horseneck",
1700000);
INSERT INTO branch VALUES("Pownal", "Bennington", 300000);
INSERT INTO branch VALUES("Redwood", "Palo Alto", 2100000);
INSERT INTO branch VALUES("Round Hill", "Horseneck",
8000000);

-- Inserting data into `depositor`
INSERT INTO depositor VALUES("Hayes", "A-102");
INSERT INTO depositor VALUES("Johnson", "A-101");
INSERT INTO depositor VALUES("Johnson", "A-201");
INSERT INTO depositor VALUES("Jones", "A-217");
INSERT INTO depositor VALUES("Lindsay", "A-222");
INSERT INTO depositor VALUES("Smith", "A-215");
INSERT INTO depositor VALUES("Turner", "A-305");

-- Inserting data into `customer`
INSERT INTO customer VALUES("Adams", "Spring",
"Pittsfield");
INSERT INTO customer VALUES("Brooks", "Senator",
"Brooklyn");
INSERT INTO customer VALUES("Curry", "North", "Rye");
INSERT INTO customer VALUES("Glenn", "Sand Hill",
"Woodside");
INSERT INTO customer VALUES("Green", "Walnut", "Stamford");
INSERT INTO customer VALUES("Hayes", "Main", "Harrison");
INSERT INTO customer VALUES("Johnson", "Alma", "Palo
Alto");
INSERT INTO customer VALUES("Jones", "Main", "Harrison");

```

```
INSERT INTO customer VALUES("Lindsay", "Park",  
"Pittsfield");  
INSERT INTO customer VALUES("Smith", "North", "Rye");  
INSERT INTO customer VALUES("Turner", "Putnam",  
"Stamford");  
INSERT INTO customer VALUES("Williams", "Nassau",  
"Princeton");  
  
-- Inserting data into `loan`  
INSERT INTO loan VALUES("L-11", "Round Hill", 900);  
INSERT INTO loan VALUES("L-14", "Downtown", 1500);  
INSERT INTO loan VALUES("L-15", "Perryridge", 1500);  
INSERT INTO loan VALUES("L-16", "Perryridge", 1300);  
INSERT INTO loan VALUES("L-17", "Downtown", 1000);  
INSERT INTO loan VALUES("L-23", "Redwood", 2000);  
INSERT INTO loan VALUES("L-93", "Mianus", 500);  
  
-- Inserting data into `borrower`  
INSERT INTO borrower VALUES("Adams", "L-16");  
INSERT INTO borrower VALUES("Curry", "L-93");  
INSERT INTO borrower VALUES("Hayes", "L-15");  
INSERT INTO borrower VALUES("Johnson", "L-14");  
INSERT INTO borrower VALUES("Jones", "L-17");  
INSERT INTO borrower VALUES("Smith", "L-11");  
INSERT INTO borrower VALUES("Smith", "L-23");  
INSERT INTO borrower VALUES("Williams", "L-17");
```

account_number	branch_name	balance
A-101	Downtown	500
A-102	Perryridge	400
A-201	Brighton	900
A-215	Mianus	700
A-217	Brighton	750
A-222	Redwood	700
A-305	Round Hill	350

Figure - 1.1. account relation

branch_name	branch_city	assets
Brighton	Brooklyn	7100000
Downtown	Brooklyn	9000000
Mianus	Horseneck	400000
North Town	Rye	3700000
Perryridge	Horseneck	1700000
Pownal	Bennington	300000
Redwood	Palo Alto	2100000
Round Hill	Horseneck	8000000

Figure - 1.2. branch relation

customer_name	account_number
Hayes	A-102
Johnson	A-101
Johnson	A-201
Jones	A-217
Lindsay	A-222
Smith	A-215
Turner	A-305

Figure - 1.3. depositor relation

customer_name	customer_street	customer_city
Adams	Spring	Pittsfield
Brooks	Senator	Brooklyn
Curry	North	Rye
Glenn	Sand Hill	Woodside
Green	Walnut	Stamford
Hayes	Main	Harrison
Johnson	Alma	Palo Alto
Jones	Main	Harrison
Lindsay	Park	Pittsfield
Smith	North	Rye
Turner	Putnam	Stamford
Williams	Nassau	Princeton

Figure - 1.4. customer relation

loan_number	branch_name	amount
L-11	Round Hill	900
L-14	Downtown	1500
L-15	Perryridge	1500
L-16	Perryridge	1300
L-17	Downtown	1000
L-23	Redwood	2000
L-93	Mianus	500

Figure - 1.5. loan relation

customer_name	loan_number
Adams	L-16
Curry	L-93
Hayes	L-15
Johnson	L-14
Jones	L-17
Smith	L-11
Smith	L-23
Williams	L-17

Figure - 1.6. borrower relation

1. Primary Key Definition

Primary key **while** table creation:

```
CREATE TABLE customer(customer_name varchar(30) PRIMARY
KEY, c_street varchar(20), c_city varchar(30));
```

Primary key **after** table creation:

```
ALTER TABLE customer ADD PRIMARY KEY(customer_name);
```

A table can only contain **one primary key**. The column that has unique values can become the primary key.

2. Composite Primary Key Definition

When we construct a primary key using multiple columns, it is referred to as a **Composite Primary Key**. This is demonstrated in the `borrower` table.

Composite primary key **while** table creation:

```
CREATE TABLE borrower(customer_name varchar(30),  
loan_number varchar(10), PRIMARY KEY(customer_name,  
loan_number));
```

Composite primary key **after** table creation:

```
ALTER TABLE customer ADD PRIMARY KEY(customer_name,  
loan_number);
```

3. Primary Key Definition of Multiple Tables

Definition of Primary Key in the given six tables:

```
ALTER TABLE account ADD PRIMARY KEY(account_number);  
ALTER TABLE branch ADD PRIMARY KEY(branch_name);  
ALTER TABLE depositor ADD PRIMARY KEY(customer_name,  
account_number);
```



```
ALTER TABLE customer ADD PRIMARY KEY(customer_name);
ALTER TABLE loan ADD PRIMARY KEY(loan_number);
ALTER TABLE borrower ADD PRIMARY KEY(customer_name,
loan_number);
```






















<div><div><div><div></div><div></div><div></div></div></div><div></div></div>				account_number	branch_name	balance
<input type="checkbox"/>	 Edit	 Copy	 Delete	A-101	Downtown	500
<input type="checkbox"/>	 Edit	 Copy	 Delete	A-102	Perryridge	400
<input type="checkbox"/>	 Edit	 Copy	 Delete	A-201	Brighton	900
<input type="checkbox"/>	 Edit	 Copy	 Delete	A-215	Mianus	700
<input type="checkbox"/>	 Edit	 Copy	 Delete	A-217	Brighton	750
<input type="checkbox"/>	 Edit	 Copy	 Delete	A-222	Redwood	700
<input type="checkbox"/>	 Edit	 Copy	 Delete	A-305	Round Hill	350

Figure - 1.7. account relation

























<div><div>←T→</div><div></div></div>				branch_name	branch_city	assets
<input type="checkbox"/>	 Edit	 Copy	 Delete	Brighton	Brooklyn	7100000
<input type="checkbox"/>	 Edit	 Copy	 Delete	Downtown	Brooklyn	9000000
<input type="checkbox"/>	 Edit	 Copy	 Delete	Mianus	Horseneck	400000
<input type="checkbox"/>	 Edit	 Copy	 Delete	North Town	Rye	3700000
<input type="checkbox"/>	 Edit	 Copy	 Delete	Perryridge	Horseneck	1700000
<input type="checkbox"/>	 Edit	 Copy	 Delete	Pownal	Bennington	300000
<input type="checkbox"/>	 Edit	 Copy	 Delete	Redwood	Palo Alto	2100000
<input type="checkbox"/>	 Edit	 Copy	 Delete	Round Hill	Horseneck	8000000

Figure - 1.8. branch relation






















<div><div>←</div><div>T</div><div>→</div></div>					customer_name	account_number
<input type="checkbox"/>		Edit	 Copy	 Delete	Hayes	A-102
<input type="checkbox"/>		Edit	 Copy	 Delete	Johnson	A-101
<input type="checkbox"/>		Edit	 Copy	 Delete	Johnson	A-201
<input type="checkbox"/>		Edit	 Copy	 Delete	Jones	A-217
<input type="checkbox"/>		Edit	 Copy	 Delete	Lindsay	A-222
<input type="checkbox"/>		Edit	 Copy	 Delete	Smith	A-215
<input type="checkbox"/>		Edit	 Copy	 Delete	Turner	A-305

Figure - 1.9. depositor relation



				customer_name	customer_street	customer_city			
<input type="checkbox"/>		Edit		Copy		Delete	Adams	Spring	Pittsfield
<input type="checkbox"/>		Edit		Copy		Delete	Brooks	Senator	Brooklyn
<input type="checkbox"/>		Edit		Copy		Delete	Curry	North	Rye
<input type="checkbox"/>		Edit		Copy		Delete	Glenn	Sand Hill	Woodside
<input type="checkbox"/>		Edit		Copy		Delete	Green	Walnut	Stamford
<input type="checkbox"/>		Edit		Copy		Delete	Hayes	Main	Harrison
<input type="checkbox"/>		Edit		Copy		Delete	Johnson	Alma	Palo Alto
<input type="checkbox"/>		Edit		Copy		Delete	Jones	Main	Harrison
<input type="checkbox"/>		Edit		Copy		Delete	Lindsay	Park	Pittsfield
<input type="checkbox"/>		Edit		Copy		Delete	Smith	North	Rye
<input type="checkbox"/>		Edit		Copy		Delete	Turner	Putnam	Stamford
<input type="checkbox"/>		Edit		Copy		Delete	Williams	Nassau	Princeton

Figure - 1.10. customer relation






















<div><div><div>←</div><div>T</div><div>→</div></div></div>				loan_number	branch_name	amount
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-11	Round Hill	900
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-14	Downtown	1500
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-15	Perryridge	1500
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-16	Perryridge	1300
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-17	Downtown	1000
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-23	Redwood	2000
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-93	Mianus	500

Figure - 1.11. loan relation

























<div><div><div>←</div><div>T</div><div>→</div></div></div>					customer_name	loan_number
<input type="checkbox"/>	 Edit	 Copy	 Delete	Adams	L-16	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Curry	L-93	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Hayes	L-15	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Johnson	L-14	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Jones	L-17	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Smith	L-11	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Smith	L-23	
<input type="checkbox"/>	 Edit	 Copy	 Delete	Williams	L-17	

Figure - 1.12. borrower relation

Lab Tasks

1. Find the names of all branches in the **loan** relation

```
SELECT DISTINCT branch_name FROM loan;
```

















				branch_name
<input type="checkbox"/>	 Edit	 Copy	 Delete	Round Hill
<input type="checkbox"/>	 Edit	 Copy	 Delete	Downtown
<input type="checkbox"/>	 Edit	 Copy	 Delete	Perryridge
<input type="checkbox"/>	 Edit	 Copy	 Delete	Redwood
<input type="checkbox"/>	 Edit	 Copy	 Delete	Mianus

Figure - 1.13. Task 1

2. Find all loan numbers for loans made at the **Perryridge** branch with loan amounts greater than 300

```
SELECT loan_number FROM loan WHERE branch_name="Perryridge"  
AND amount > 300;
```






				loan_number
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-15
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-16

Figure - 1.14. Task 2

3. Find all the loan numbers of the customers who has loan either **Perryridge** branch or **Downtown** branch

```
SELECT loan_number FROM loan WHERE branch_name
IN("Perryridge", "Downtown");
```














				loan_number
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-14
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-15
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-16
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-17

Figure - 1.15. Task 3

4. Find all the loan numbers of the customers who has loan either **Perryridge** branch or **Downtown** branch or **Mianus** branch

```
SELECT loan_number FROM loan WHERE branch_name  
IN("Perryridge", "Downtown", "Mianus");
```
















				loan_number
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-14
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-15
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-16
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-17
<input type="checkbox"/>	 Edit	 Copy	 Delete	L-93

Figure - 1.16. Task 4

5. Find the names of all customers who are not from **Stamford** or **Princeton** or **Harrison** city

```
SELECT customer_name FROM customer WHERE customer_city  
NOT IN("Stamford", "Princeton", "Harrison");
```























				customer_name
<input type="checkbox"/>	 Edit	 Copy	 Delete	Adams
<input type="checkbox"/>	 Edit	 Copy	 Delete	Brooks
<input type="checkbox"/>	 Edit	 Copy	 Delete	Curry
<input type="checkbox"/>	 Edit	 Copy	 Delete	Glenn
<input type="checkbox"/>	 Edit	 Copy	 Delete	Johnson
<input type="checkbox"/>	 Edit	 Copy	 Delete	Lindsay
<input type="checkbox"/>	 Edit	 Copy	 Delete	Smith

Figure - 1.17. Task 5

6. Find the largest, minimum, and average account balance in the **account** relation

```
SELECT Max(balance) "Maximum", Min(balance) "Minimum",
Avg(balance) "Average" FROM account;
```

Maximum	Minimum	Average
900	350	614.2857

Figure - 1.18. Task 6

7. Find the total number of customer from **customer** relation

```
SELECT Count(customer_name) "Total no. of Customers" FROM customer;
```

Total no. of Customers

12

Figure - 1.19. Task 7

8. Find the loan number of those loans with loan amounts between 400 and 800 (inclusive)

```
SELECT loan_number FROM loan WHERE amount ≥ 400 AND amount ≤ 800;
```

Alternative approach:

```
SELECT loan_number FROM loan WHERE amount BETWEEN 400 AND 800;
```

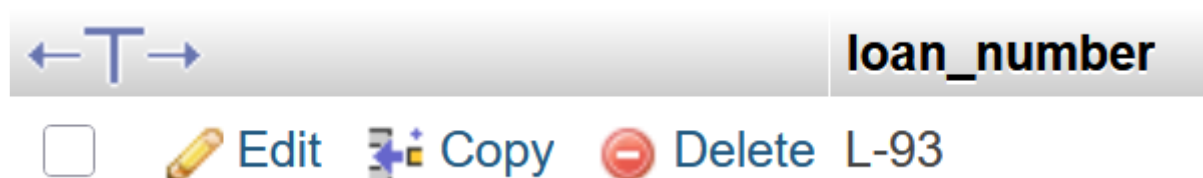


Figure - 1.20. Task 8

9. Find the names of all customers whose name start with **G**

```
SELECT customer_name FROM customer WHERE customer_name LIKE "G%";
```








				customer_name
<input type="checkbox"/>	 Edit	 Copy	 Delete	Glenn
<input type="checkbox"/>	 Edit	 Copy	 Delete	Green

Figure - 1.21. Task 9

10. Find the names of all customers whose name ends with **s**

```
SELECT customer_name FROM customer WHERE customer_name LIKE "%s";
```

















				customer_name
<input type="checkbox"/>	 Edit	 Copy	 Delete	Adams
<input type="checkbox"/>	 Edit	 Copy	 Delete	Brooks
<input type="checkbox"/>	 Edit	 Copy	 Delete	Hayes
<input type="checkbox"/>	 Edit	 Copy	 Delete	Jones
<input type="checkbox"/>	 Edit	 Copy	 Delete	Williams

Figure - 1.22. Task 10

11. Find the names of all customers whose name has a **o** in 2nd position

```
SELECT customer_name FROM customer WHERE customer_name LIKE "_o%";
```








				customer_name
<input type="checkbox"/>	 Edit	 Copy	 Delete	Johnson
<input type="checkbox"/>	 Edit	 Copy	 Delete	Jones

Figure - 1.23. Task 11

12. Find the names of all customers whose name has a **o** in any position except 1st and last letter

```
SELECT customer_name FROM customer WHERE customer_name LIKE "%o%";
```







				customer_name
<input type="checkbox"/>	 Edit	 Copy	 Delete	Brooks
<input type="checkbox"/>	 Edit	 Copy	 Delete	Johnson
<input type="checkbox"/>	 Edit	 Copy	 Delete	Jones

Figure - 1.24. Task 12

13. Find the length of the name of all customers from **customer** relation

```
SELECT customer_name, Length(customer_name) "Length" FROM customer;
```





































← T →				customer_name	Length
<input type="checkbox"/>	 Edit	 Copy	 Delete	Adams	5
<input type="checkbox"/>	 Edit	 Copy	 Delete	Brooks	6
<input type="checkbox"/>	 Edit	 Copy	 Delete	Curry	5
<input type="checkbox"/>	 Edit	 Copy	 Delete	Glenn	5
<input type="checkbox"/>	 Edit	 Copy	 Delete	Green	5
<input type="checkbox"/>	 Edit	 Copy	 Delete	Hayes	5
<input type="checkbox"/>	 Edit	 Copy	 Delete	Johnson	7
<input type="checkbox"/>	 Edit	 Copy	 Delete	Jones	5
<input type="checkbox"/>	 Edit	 Copy	 Delete	Lindsay	7
<input type="checkbox"/>	 Edit	 Copy	 Delete	Smith	5
<input type="checkbox"/>	 Edit	 Copy	 Delete	Turner	6
<input type="checkbox"/>	 Edit	 Copy	 Delete	Williams	8

Figure - 1.25. Task 13

14. Find 1st three characters of each customer name from **customer** relation

```
SELECT customer_name, SUBSTR(customer_name, 1, 3) "Name
Initials" FROM customer;
```





































← T →				customer_name	Name Initials
<input type="checkbox"/>	 Edit	 Copy	 Delete	Adams	Ada
<input type="checkbox"/>	 Edit	 Copy	 Delete	Brooks	Bro
<input type="checkbox"/>	 Edit	 Copy	 Delete	Curry	Cur
<input type="checkbox"/>	 Edit	 Copy	 Delete	Glenn	Gle
<input type="checkbox"/>	 Edit	 Copy	 Delete	Green	Gre
<input type="checkbox"/>	 Edit	 Copy	 Delete	Hayes	Hay
<input type="checkbox"/>	 Edit	 Copy	 Delete	Johnson	Joh
<input type="checkbox"/>	 Edit	 Copy	 Delete	Jones	Jon
<input type="checkbox"/>	 Edit	 Copy	 Delete	Lindsay	Lin
<input type="checkbox"/>	 Edit	 Copy	 Delete	Smith	Smi
<input type="checkbox"/>	 Edit	 Copy	 Delete	Turner	Tur
<input type="checkbox"/>	 Edit	 Copy	 Delete	Williams	Wil

Figure - 1.26. Task 14

SUBSTR function definition:

SUBSTR(column_name, start_position, length_of_substring)

Note

The `start_position` is 1 based.