

Chapter 17 – Lab Solution

Transactions

Exercise 1.a Answer

BEGIN;

INSERT INTO account values ('DBSYS', 'Downtown', 5000);

INSERT INTO customer values ('Myname', 'Anam', 'Seoul');

INSERT INTO depositor values ('Myname', 'DBSYS');

COMMIT;

```
postgres=# BEGIN;
BEGIN
postgres=# INSERT INTO account values ('DBSYS', 'Downtown', 5000);
INSERT 0 1
postgres=# INSERT INTO customer values ('Myname', 'Anam', 'Seoul');
INSERT 0 1
postgres=# INSERT INTO depositor values ('Myname', 'DBSYS');
INSERT 0 1
postgres=# COMMIT;
COMMIT
postgres=# SELECT * FROM depositor;
 customer_name | account_number
-----+-----
 Johnson      | A-101
 Smith        | A-215
 Hayes        | A-102
 Hayes        | A-101
 Turner       | A-305
 Johnson      | A-201
 Jones        | A-217
 Lindsay      | A-222
 Majeris      | A-333
 Smith        | A-444
 Myname       | DBSYS
(11개 행)
```

Exercise 1.b Answer

BEGIN;

DELETE FROM depositor WHERE customer_name='Myname';

DELETE FROM customer WHERE customer_name='Myname';

DELETE FROM account WHERE account_number='DBSYS';

COMMIT;

```
postgres=# BEGIN;
BEGIN
postgres=# DELETE FROM depositor WHERE customer_name='Myname';
DELETE 1
postgres=# DELETE FROM customer WHERE customer_name='Myname';
DELETE 1
postgres=# DELETE FROM account WHERE account_number='DBSYS';
DELETE 1
postgres=# COMMIT;
COMMIT
postgres=# SELECT * FROM depositor;
 customer_name | account_number
-----+-----
Johnson       | A-101
Smith          | A-215
Hayes          | A-102
Hayes          | A-101
Turner         | A-305
Johnson       | A-201
Jones          | A-217
Lindsay       | A-222
Majeris        | A-333
Smith          | A-444
(10개 행)
```

Exercise 1.c Answer

BEGIN;

UPDATE account SET balance=balance-200 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Johnson') AND branch_name='Downtown';

UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Smith') AND branch_name='Mianus';

UPDATE branch SET assets=assets-200 WHERE branch_name='Downtown';

UPDATE branch SET assets=assets+200 WHERE branch_name='Mianus';

COMMIT;

```
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance-200 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Johnson') AND branch_name='Downtown';
UPDATE 1
postgres=# UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Smith') AND branch_name='Mianus';
UPDATE 1
postgres=# UPDATE branch SET assets=assets-200 WHERE branch_name='Downtown';
UPDATE 1
postgres=# UPDATE branch SET assets=assets+200 WHERE branch_name='Mianus';
UPDATE 1
postgres=# COMMIT;
COMMIT
```

Exercise 1.c Answer

```
postgres=# SELECT * FROM depositor;
customer_name | account_number
-----
Johnson      | A-101
Smith         | A-215
Hayes         | A-102
Hayes         | A-101
Turner        | A-305
Johnson      | A-201
Jones         | A-217
Lindsay       | A-222
Majeris       | A-333
Smith         | A-444
(10개 행)
```

branch_name != 'Downtown'

branch_name != 'Mianus'

```
postgres=# SELECT * FROM account;
account_number | branch_name | balance
-----
A-101          | Downtown    | 500
A-215          | Mianus      | 700
A-102          | Perryridge  | 400
A-305          | Round Hill  | 350
A-201          | Perryridge  | 900
A-222          | Redwood     | 700
A-217          | Brighton    | 750
A-333          | Central     | 850
A-444          | North Town  | 625
(9개 행)
```

```
postgres=# SELECT * FROM branch;
branch_name | branch_city | assets
-----
Downtown    | Brooklyn   | 900000
Redwood     | Palo Alto  | 2100000
Perryridge  | Horseneck  | 1700000
Round Hill  | Horseneck  | 8000000
Mianus      | Horseneck  | 400200
Round Hill  | Horseneck  | 8000000
Pownal      | Bennington | 400000
North Town  | Rye        | 3700000
Brighton    | Brooklyn   | 7000000
Central     | Rye        | 400280
(9개 행)
```



```
postgres=# SELECT * FROM account;
account_number | branch_name | balance
-----
A-102          | Perryridge  | 400
A-305          | Round Hill  | 350
A-201          | Perryridge  | 900
A-222          | Redwood     | 700
A-217          | Brighton    | 750
A-333          | Central     | 850
A-444          | North Town  | 625
A-101          | Downtown    | 300
A-215          | Mianus      | 900
(9개 행)
```

```
postgres=# SELECT * FROM branch;
branch_name | branch_city | assets
-----
Redwood     | Palo Alto  | 2100000
Perryridge  | Horseneck  | 1700000
Round Hill  | Horseneck  | 8000000
Pownal      | Bennington | 400000
North Town  | Rye        | 3700000
Brighton    | Brooklyn   | 7000000
Central     | Rye        | 400280
Downtown    | Brooklyn   | 899800
Mianus      | Horseneck  | 400400
(9개 행)
```

Exercise 2.a Answer

BEGIN;

UPDATE account SET balance=balance-100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Lindsay');

UPDATE account SET balance=balance+100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Turner');

COMMIT;

```
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance-100 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
UPDATE 1
postgres=# UPDATE account SET balance=balance+100 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Turner');
UPDATE 1
postgres=# COMMIT;
COMMIT
```

Exercise 2.a Answer

```
postgres=# SELECT * FROM depositor;
 customer_name | account_number
-----
 Johnson       | A-101
 Smith         | A-215
 Hayes         | A-102
 Hayes         | A-101
 Turner        | A-305
 Johnson       | A-201
 Jones         | A-217
 Lindsay       | A-222
 Majeris       | A-333
 Smith         | A-444
(10개 행)
```

```
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----
 A-102          | Perryridge  | 400
 A-305          | Round Hill  | 350
 A-201          | Perryridge  | 900
 A-222          | Redwood     | 700
 A-217          | Brighton    | 750
 A-333          | Central     | 850
 A-444          | North Town  | 625
 A-101          | Downtown    | 300
 A-215          | Mianus      | 900
(9개 행)
```



```
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----
 A-102          | Perryridge  | 400
 A-201          | Perryridge  | 900
 A-217          | Brighton    | 750
 A-333          | Central     | 850
 A-444          | North Town  | 625
 A-101          | Downtown    | 300
 A-215          | Mianus      | 900
 A-222          | Redwood     | 600
 A-305          | Round Hill  | 450
(9개 행)
```

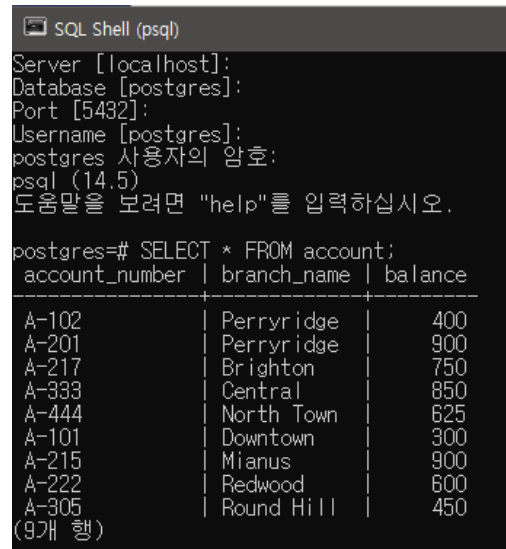
Exercise 2.b Answer

BEGIN;

UPDATE account SET balance=0;

```
postgres=# BEGIN;  
BEGIN  
postgres=# UPDATE account SET balance=0;  
UPDATE 9  
postgres=#
```

- Close the window without COMMIT
- The result is as follows (update is not applied)



```
SQL Shell (psql)  
Server [localhost]:  
Database [postgres]:  
Port [5432]:  
Username [postgres]:  
postgres 사용자의 암호:  
psql (14.5)  
도움말을 보려면 "help"를 입력하십시오.  
  
postgres=# SELECT * FROM account;  
 account_number | branch_name | balance  
-----  
A-102           | Perryridge |      400  
A-201           | Perryridge |      900  
A-217           | Brighton   |      750  
A-333           | Central    |      850  
A-444           | North Town |      625  
A-101           | Downtown   |      300  
A-215           | Mianus     |      900  
A-222           | Redwood    |      600  
A-305           | Round Hill |      450  
(9개 행)
```


Exercise 3 Answer

BEGIN;

UPDATE account SET balance=balance-100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Lindsay');

SAVEPOINT sp;

UPDATE account SET balance=balance+100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Turner');

ROLLBACK to sp;

UPDATE account SET balance=balance+100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Jones');

COMMIT;

```
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance-100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Lindsay');
UPDATE 1
postgres=# SAVEPOINT sp;
SAVEPOINT
postgres=# UPDATE account SET balance=balance+100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Turner');
UPDATE 1
postgres=# ROLLBACK to sp;
ROLLBACK
postgres=# UPDATE account SET balance=balance+100 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Jones');
UPDATE 1
postgres=# COMMIT;
COMMIT
```

Exercise 3 Answer

```
postgres=# SELECT * FROM depositor;
 customer_name | account_number
-----
 Johnson       | A-101
 Smith         | A-215
 Hayes         | A-102
 Hayes         | A-101
 Turner        | A-305
 Johnson       | A-201
 Jones         | A-217
 Lindsay       | A-222
 Majeris       | A-333
 Smith         | A-444
(10개 행)
```

```
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----
 A-102          | Perryridge  | 400
 A-201          | Perryridge  | 900
 A-217          | Brighton    | 750
 A-333          | Central     | 850
 A-444          | North Town  | 625
 A-101          | Downtown   | 300
 A-215          | Mianus      | 900
 A-222          | Redwood     | 600
 A-305          | Round Hill  | 450
(9개 행)
```



```
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----
 A-102          | Perryridge  | 400
 A-201          | Perryridge  | 900
 A-333          | Central     | 850
 A-444          | North Town  | 625
 A-101          | Downtown   | 300
 A-215          | Mianus      | 900
 A-305          | Round Hill  | 450
 A-222          | Redwood     | 500
 A-217          | Brighton    | 850
(9개 행)
```

Exercise 4.a Answer

- Window A

BEGIN;

UPDATE account SET balance=balance+300 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Lindsay');

- Window B

BEGIN;

UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Lindsay');

- The window B is waiting the update from the window A

```
SQL Shell (psql)
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+300 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
UPDATE 1
postgres=#

SQL Shell (psql)
Server [localhost]:
Database [postgres]:
Port [5432]:
Username [postgres]:
postgres 사용자의 암호:
psql (14.5)
도움말을 보려면 "help"를 입력하십시오.

postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
```

Exercise 4.a Answer

- COMMIT (original balance=700)
 - The balance becomes 1000 by the update of the window A
 - After that it becomes 1200 by the update of the window B

```
postgres=# SELECT * FROM depositor;
customer_name | account_number
-----
Johnson      | A-101
Smith         | A-215
Hayes         | A-102
Hayes         | A-101
Turner        | A-305
Johnson      | A-201
Jones         | A-217
Lindsay       | A-222
Majeris       | A-333
Smith         | A-444
(10개 행)
```

```
SQL Shell (psql)
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+300 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
UPDATE 1
postgres=# COMMIT;
COMMIT
postgres=#

SQL Shell (psql)
Server [localhost]:
Database [postgres]:
Port [5432]:
Username [postgres]:
postgres 사용자의 암호:
psql (14.5)
도움말을 보려면 "help"를 입력하십시오.

postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
UPDATE 1
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----
A-101           | Downtown   | 500
A-215           | Mianus     | 700
A-102           | Perryridge | 400
A-305           | Round Hill | 350
A-201           | Perryridge | 900
A-217           | Brighton   | 750
A-333           | Central    | 850
A-444           | North Town | 625
A-222           | Redwood    | 1200
(9개 행)
```

Exercise 4.a Answer

- ROLLBACK (original balance=700)
 - The balance remains 700 by the rollback of the window A
 - After that it becomes 900 by the update of the window B

```
postgres=# SELECT * FROM depositor;
 customer_name | account_number
-----
 Johnson       | A-101
 Smith         | A-215
 Hayes         | A-102
 Hayes         | A-101
 Turner        | A-305
 Johnson       | A-201
 Jones         | A-217
 Lindsay       | A-222
 Majeris       | A-333
 Smith         | A-444
(10개 행)
```

```
SQL Shell (psql)
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+300 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
UPDATE 1
postgres=# ROLLBACK;
ROLLBACK
postgres=#

SQL Shell (psql)
Server [localhost]:
Database [postgres]:
Port [5432]:
Username [postgres]:
postgres 사용자의 암호:
psql (14.5)
도움말을 보려면 "help"를 입력하십시오.

postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
UPDATE 1
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----
 A-101          | Downtown   | 500
 A-215          | Mianus     | 700
 A-102          | Perryridge | 400
 A-305          | Round Hill | 350
 A-201          | Perryridge | 900
 A-217          | Brighton   | 750
 A-333          | Central    | 850
 A-444          | North Town | 625
 A-222          | Redwood    | 900
(9개 행)
```

Exercise 4.b Answer

- Window A

BEGIN;

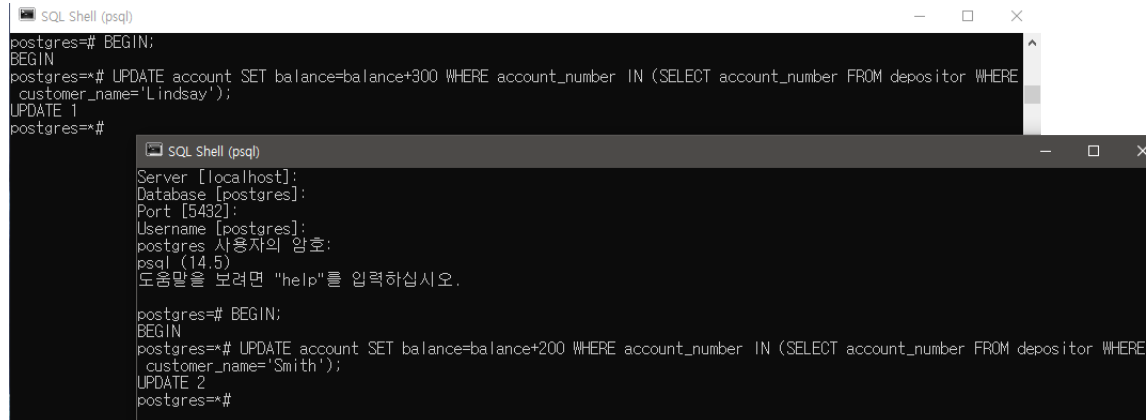
UPDATE account SET balance=balance+300 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Lindsay');

- Window B

BEGIN;

UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE customer_name='Smith');

- It is instantly updated



```
SQL Shell (psql)
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+300 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Lindsay');
UPDATE 1
postgres=#
```

```
SQL Shell (psql)
Server [localhost]:
Database [postgres]:
Port [5432]:
Username [postgres]:
postgres 사용자의 암호:
psql (14.5)
도움말을 보려면 "help"를 입력하십시오.

postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+200 WHERE account_number IN (SELECT account_number FROM depositor WHERE
customer_name='Smith');
UPDATE 2
postgres=#
```

Exercise 5.a Answer

- Read committed – Dirty read (not possible)

Window A

```
postgres=# BEGIN;
BEGIN
postgres=# SET TRANSACTION isolation level read committed;
SET
postgres=# SELECT * FROM account WHERE account_number='A-215';
 account_number | branch_name | balance
-----
A-215           | Mianus      | 700
(1개 행)
```

```
postgres=# SELECT * FROM account WHERE account_number='A-215';
 account_number | branch_name | balance
-----
A-215           | Mianus      | 700
(1개 행)

postgres=#
```

Window B

```
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+1000 WHERE account_number='A-215';
UPDATE 1
postgres=#
```

Exercise 5.b Answer

- Read committed – Non-repeatable read (possible)

Window A

```
postgres=# BEGIN;
BEGIN
postgres=# SET TRANSACTION isolation level read committed;
SET
postgres=# SELECT * FROM account WHERE account_number='A-215';
 account_number | branch_name | balance
-----
A-215           | Mianus      |      700
(1개 행)
```

```
postgres=# SELECT * FROM account WHERE account_number='A-215';
 account_number | branch_name | balance
-----
A-215           | Mianus      |    1700
(1개 행)

postgres=#
```

Window B

```
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+1000 WHERE account_number='A-215';
UPDATE 1
postgres=# COMMIT;
COMMIT
postgres=#
```


Exercise 5.b Answer

- Serializable – Non-repeatable read (not possible)

Window A

```
postgres=# BEGIN;
BEGIN
postgres=# SET TRANSACTION isolation level serializable;
SET
postgres=# SELECT * FROM account WHERE account_number='A-215';
 account_number | branch_name | balance
-----+-----+-----
A-215           | Mianus      |      700
(1개 행)
```

```
postgres=# SELECT * FROM account WHERE account_number='A-215';
 account_number | branch_name | balance
-----+-----+-----
A-215           | Mianus      |      700
(1개 행)

postgres=#
```

Window B

```
postgres=# BEGIN;
BEGIN
postgres=# UPDATE account SET balance=balance+1000 WHERE account_number='A-215';
UPDATE 1
postgres=# COMMIT;
COMMIT
postgres=#
```

Exercise 5.c Answer

- Read committed – Phantom read (possible)

Window A

```
postgres=# BEGIN;
BEGIN
postgres=# SET TRANSACTION isolation level read committed;
SET
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----+-----+-----
A-101           | Downtown   |      500
A-102           | Perryridge |      400
A-305           | Round Hill |      350
A-201           | Perryridge |      900
A-222           | Redwood    |      700
A-217           | Brighton   |      750
A-333           | Central    |      850
A-444           | North Town |      625
A-215           | Mianus     |     1700
(9개 행)
```

```
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----+-----+-----
A-101           | Downtown   |      500
A-102           | Perryridge |      400
A-305           | Round Hill |      350
A-201           | Perryridge |      900
A-222           | Redwood    |      700
A-217           | Brighton   |      750
A-333           | Central    |      850
A-444           | North Town |      625
A-215           | Mianus     |     1700
DBSYS          | Downtown   |     5000
(10개 행)

postgres=#
```

Window B

```
postgres=# BEGIN;
BEGIN
postgres=# INSERT INTO account values ('DBSYS', 'Downtown', 5000);
INSERT 0 1
postgres=# COMMIT;
COMMIT
postgres=#
```

Exercise 5.c Answer

- Serializable – Phantom read (not possible)

Window A

```
postgres=# BEGIN;
BEGIN
postgres=# SET TRANSACTION isolation level serializable;
SET
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----+-----+-----
 A-101          | Downtown   |      500
 A-102          | Perryridge |      400
 A-305          | Round Hill |      350
 A-201          | Perryridge |      900
 A-222          | Redwood    |      700
 A-217          | Brighton   |      750
 A-333          | Central    |      850
 A-444          | North Town |      625
 A-215          | Mianus     |     1700
(9개 행)
```

```
postgres=# SELECT * FROM account;
 account_number | branch_name | balance
-----+-----+-----
 A-101          | Downtown   |      500
 A-102          | Perryridge |      400
 A-305          | Round Hill |      350
 A-201          | Perryridge |      900
 A-222          | Redwood    |      700
 A-217          | Brighton   |      750
 A-333          | Central    |      850
 A-444          | North Town |      625
 A-215          | Mianus     |     1700
(9개 행)

postgres=#
```

Window B

```
postgres=# BEGIN;
BEGIN
postgres=# INSERT INTO account values ('DBSYS', 'Downtown', 5000);
INSERT 0 1
postgres=# COMMIT;
COMMIT
postgres=#
```