Database Programming with PL/SQL

Using Transaction Control Statements

Objectives

This lesson covers the following objectives:

- Define a transaction and provide an example
- Construct and execute a transaction control statement in PL/SQL
- Since Oracle Application Express automatically commits changes, the following information will be presented as if you were issuing the commands in an installed/local environment with the ability to use COMMIT and ROLLBACK.

Purpose

In this lesson, you learn how to include transaction control statements such as `COMMIT`, `ROLLBACK`, and `SAVEPOINT` in PL/SQL.

Just think, if you write a paper for your teacher in pencil, you have captured your thoughts but not yet turned the paper in. If you want to change something on your paper, you can use an eraser to make the change.

Purpose (cont.)

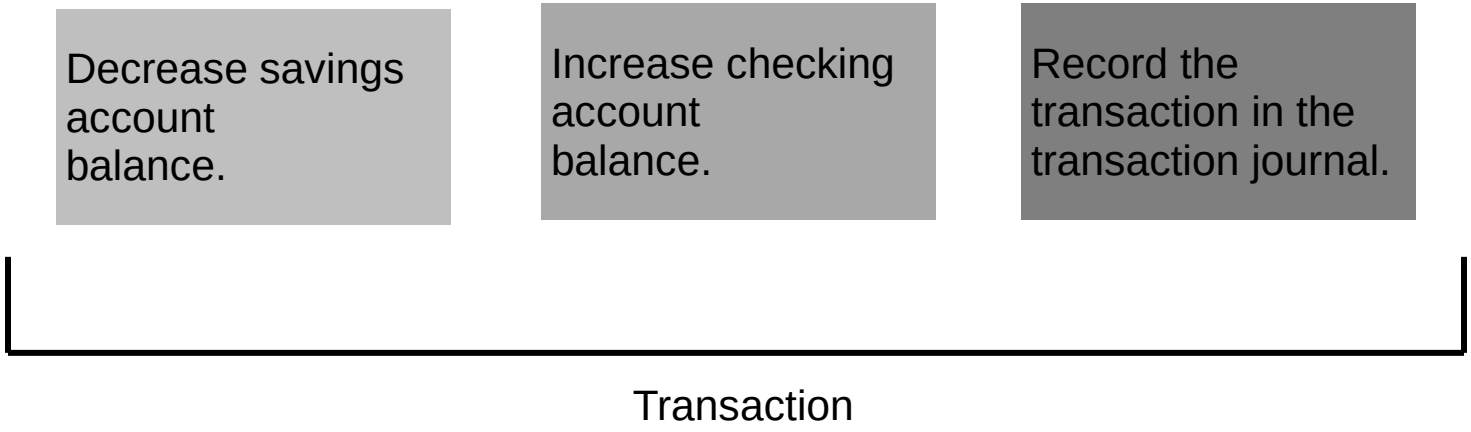
But once you turn the paper in to your teacher, you have completed the task. Transaction control statements in PL/SQL allow you to do the same thing using the keywords `COMMIT`, `ROLLBACK`, and `SAVEPOINT`.

Database Transaction

A transaction is an inseparable list of database operations that must be executed either in its entirety or not at all. Transactions maintain data integrity and guarantee that the database is always in a consistent state.

Example of a Transaction

To illustrate the concept of a transaction, consider a banking database. When a bank customer transfers money from a savings account to a checking account, the transaction can consist of three separate operations:



Example of a Transaction (cont.)

What would happen if there were insufficient funds in the savings account? Would the funds still be added to the checking account? Would an entry be logged in the transaction journal? What do you think *should* happen?

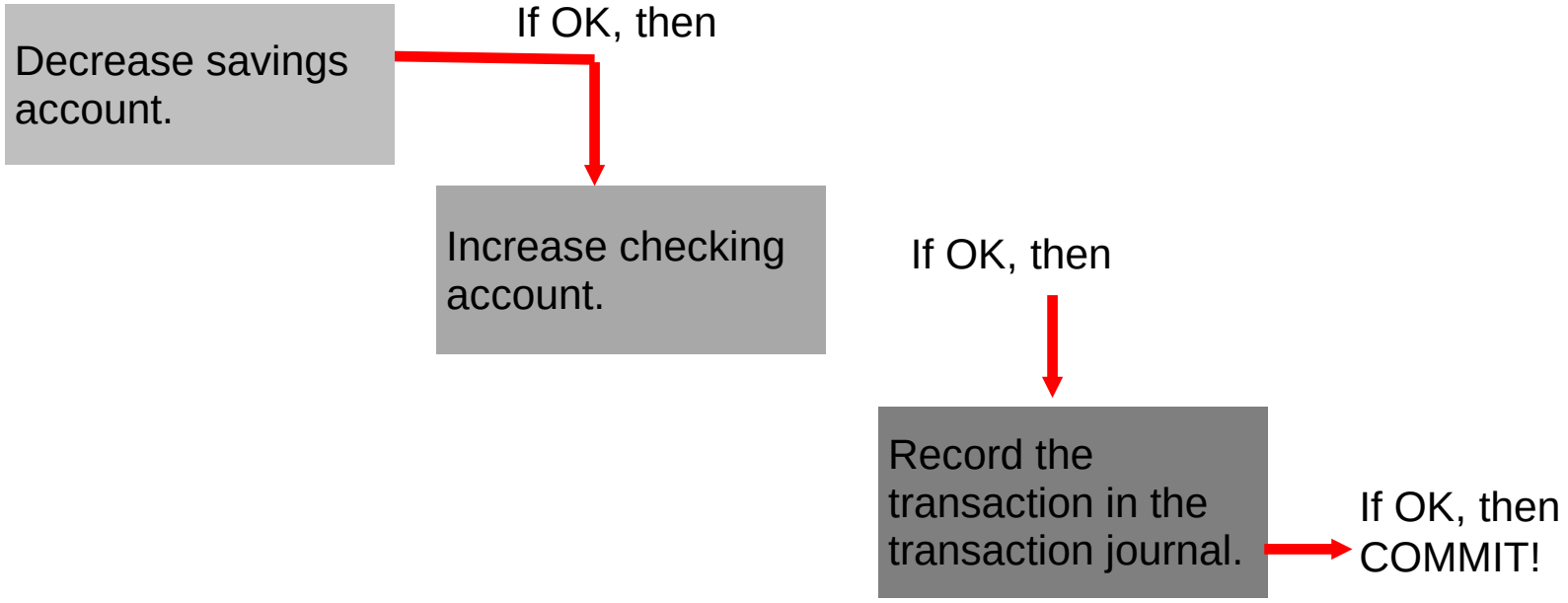
Decrease savings account balance.	`UPDATE savings_accounts`
	`SET balance = balance - 500`
	`WHERE account = 3209;`

Increase checking account balance.	`UPDATE checking_accounts`
	`SET balance = balance + 500`
	`WHERE account = 3208;`

Record the transaction in the transaction journal.	`INSERT INTO journal VALUES`
	`(journal_seq.NEXTVAL, '1B'`
	`3209, 3208, 500);`

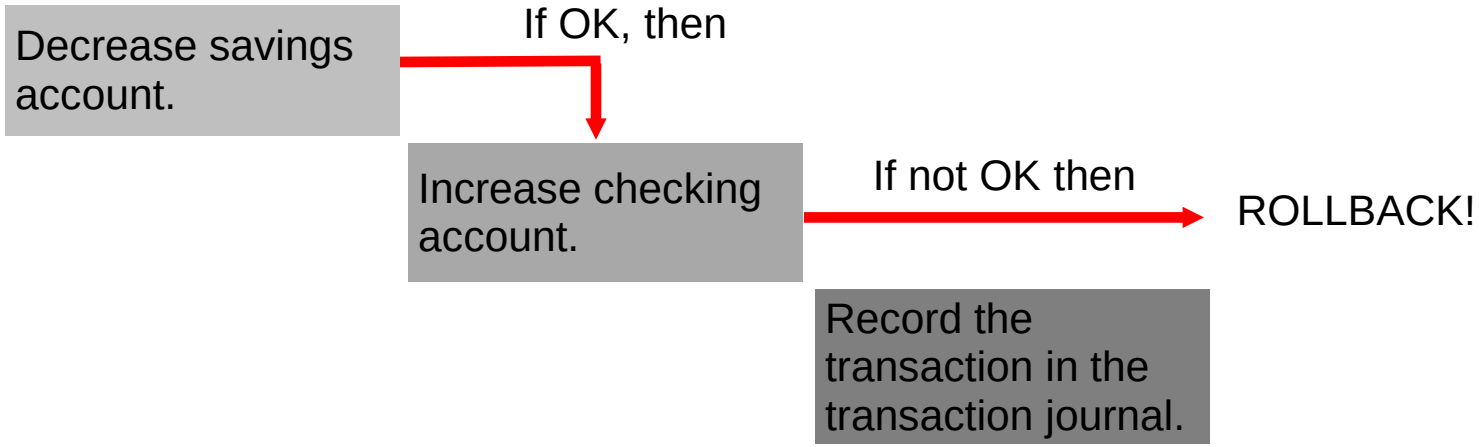
Example of a Transaction (cont.)

If all three SQL statements can be performed to maintain the accounts in proper balance, the effects of the transaction can be committed, or applied to the database tables.



Example of a Transaction (cont.)

However, if a problem, such as insufficient funds, invalid account number, or a hardware failure prevents one or two of the statements in the transaction from completing, the entire transaction must be rolled back (reversed out) so that the balance of all accounts is correct.



Transaction Control Statements

You use transaction control statements to make the changes to the database permanent or to discard them. The three main transaction control statements are:

- `COMMIT`
- `ROLLBACK`
- `SAVEPOINT`

The transaction control commands are valid in PL/SQL and therefore can be used directly in the executable or exception section of a PL/SQL block.

COMMIT

COMMIT is used to make the database changes permanent. If a transaction ends with a COMMIT statement, all the changes made to the database during that transaction are made permanent.

```
BEGIN
  INSERT INTO pairtable VALUES (1, 2);
  COMMIT;
END;
```

Note: The keyword END signals the end of a PL/SQL block, not the end of a transaction.

ROLLBACK

ROLLBACK is for discarding any changes that were made to the database after the last COMMIT. If the transaction fails, or ends with a ROLLBACK, then none of the statements takes effect.

In the example, only the second INSERT statement adds a row of data.

```
BEGIN
  INSERT INTO pairtable VALUES (3, 4);
  ROLLBACK;
  INSERT INTO pairtable VALUES (5, 6);
  COMMIT;
END;
```

SAVEPOINT

SAVEPOINT is used to mark an intermediate point in transaction processing. Only ROLLBACK can be used to a SAVEPOINT.

```
BEGIN
  INSERT INTO pairtable VALUES (7, 8);
  SAVEPOINT my_sp_1;
  INSERT INTO pairtable VALUES (9, 10);
  SAVEPOINT my_sp_2;
  INSERT INTO pairtable VALUES (11, 12);
  ROLLBACK to my_sp_1;
  INSERT INTO pairtable VALUES (13, 14);
  COMMIT;
END;
```

Terminology

Key terms used in this lesson included:

- `COMMIT`
- `END`
- `ROLLBACK`
- `SAVEPOINT`
- Transaction

Summary

In this lesson, you should have learned how to:

- Define a transaction and provide an example
- Construct and execute a transaction control statement in PL/SQL