Courses B0B36DBS, A7B36DBS: **Database Systems**

Practical Class 08:

SQL: DML and Advanced Constructs

Insert, Update, Delete, View, Index, Procedure, Transaction, Trigger

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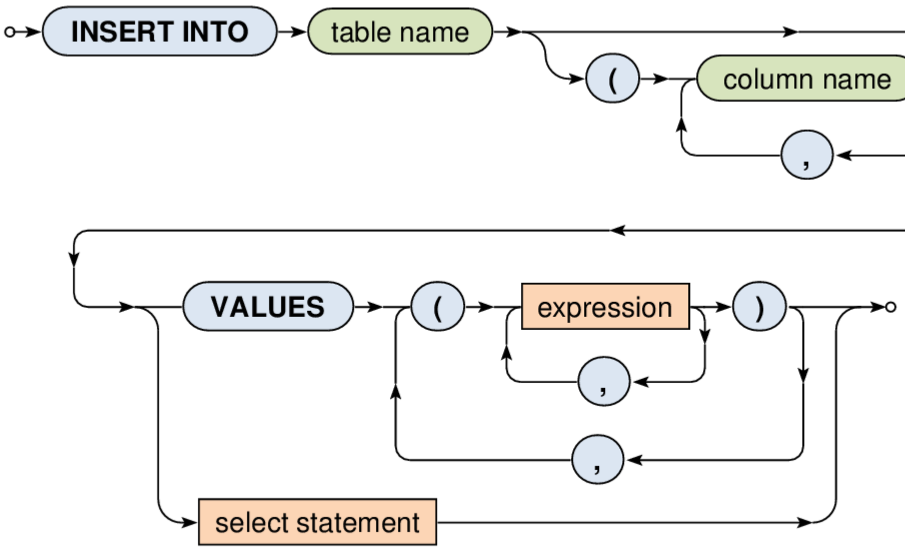
Exercises

- Assume we have the following database schema

```
CREATE TABLE accounts (
        ida INT PRIMARY KEY,
        number VARCHAR(22) NOT NULL UNIQUE,
        owner VARCHAR(100) NOT NULL,
        city VARCHAR(50) NOT NULL,
        balance DECIMAL(15, 2) NOT NULL DEFAULT 0
);
CREATE TABLE transfers (
        idt BIGINT PRIMARY KEY,
        datetime TIMESTAMP NOT NULL,
        source INT REFERENCES accounts (ida) ON DELETE SET NULL,
        target INT REFERENCES accounts (ida) ON DELETE SET NULL,
        amount DECIMAL(15, 2) NOT NULL
);
```

Insertions

- **INSERT INTO** command

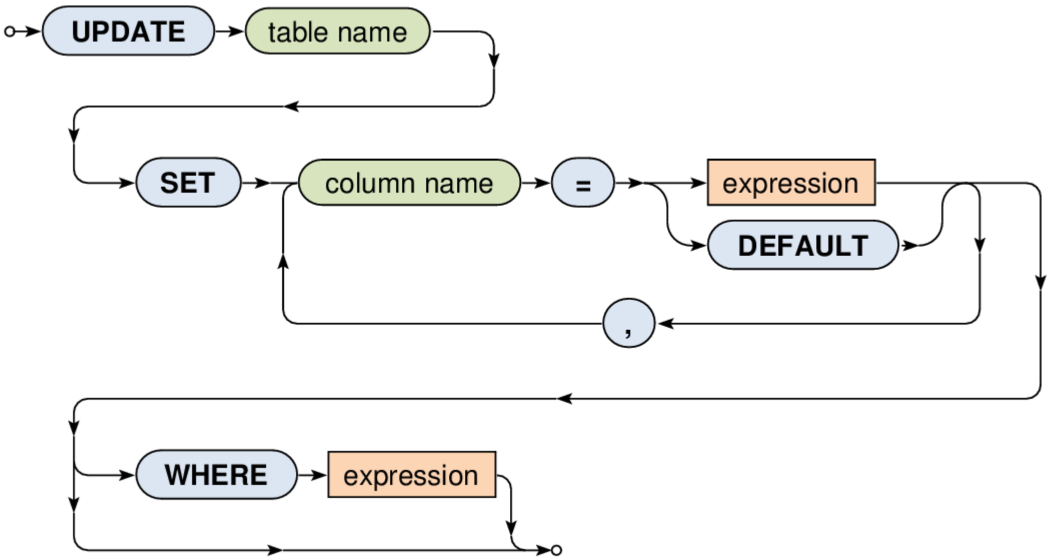


Exercise 1

- **Insert two new bank accounts** into our database
  - Use only one insert statement
  - Account A:
    - Identifier: *501*, number: *123456789/1111*
    - Owner: *Martin Svoboda*, city: *Liberec*
  - Account B:
    - Identifier: *502*, number: *101010101/1111*
    - Owner: *Irena Mlynkova*, city: *Praha*

Updates

- **UPDATE** command



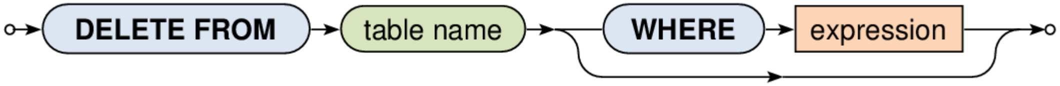
Exercise 2

- **Update details of a certain bank account**
  - Change attributes of an account with identifier *502*
    - New owner: *Irena Holubova*
    - New city: *Praha*

- **Add interests to selected accounts**
  - Only owners from *Liberec* will be rewarded
  - Interest rate equals to *1%*

Deletions

- **DELETE** command



Exercise 3

- **Remove a particular bank account**
  - Delete a bank account with number *101010101/1111*
    - What the impact will be for the following data?

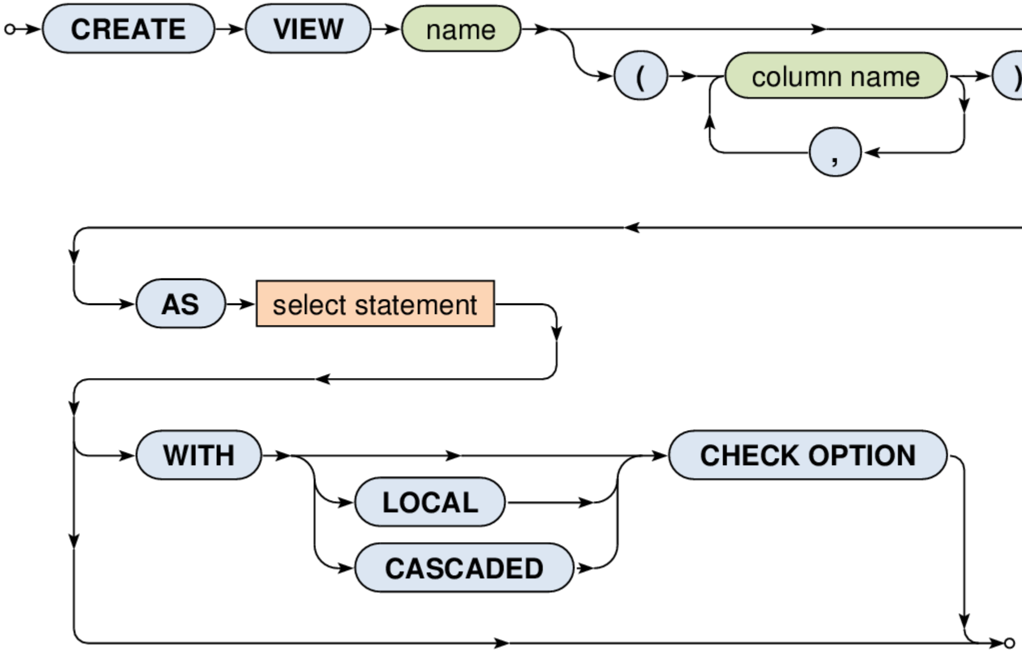
ida	number	owner	city	balance
501	123456789/1111	Martin Svoboda	Liberec	100000.00
502	101010101/1111	Irena Holubova	Praha	200000.00

idt	datetime	source	target	amount
10000034	2017-01-15 14:30:00	600	502	5000.00
10000035	2017-01-15 14:45:00	502	700	1000.00

- **Remove all bank accounts**

Views

- **CREATE VIEW** command



  - CASCADED is the default for CHECK OPTION

Exercise 4

- **Create a view on a table of accounts**
  - Select all accounts such that…
    - their owners are from *Liberec*
    - their current balance is at most *50000.00*
  - Include only the following columns
    - Identifier, number, owner and city
    - I.e. not balance

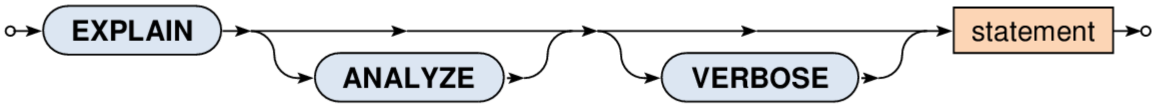
Exercise 5

- **Attempt to insert two new bank accounts** into the previous view
  - Account C:
    - Identifier: *503*, number: *111222333/1111*
    - Owner: *Jiri Helmich*, city: *Liberec*
  - Account D:
    - Identifier: *504*, number: *444555666/1111*
    - Owner: *Martin Necasky*, city: *Jicin*

- **Consider different view updateability options**

Query Plans

- **EXPLAIN** command



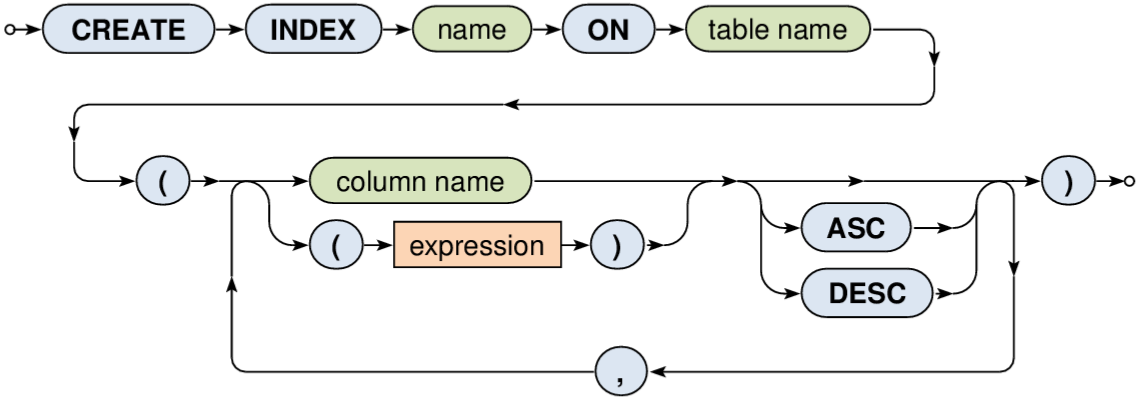
Exercise 6

- Express the following select query
  - **Bank accounts of clients from *Liberec* with current balance below the overall average**
  - Include all the original columns and calculate also the **overall number of outgoing transfers** for each such account

- **Analyze the query evaluation plan**

Indexes

- **CREATE INDEX** command



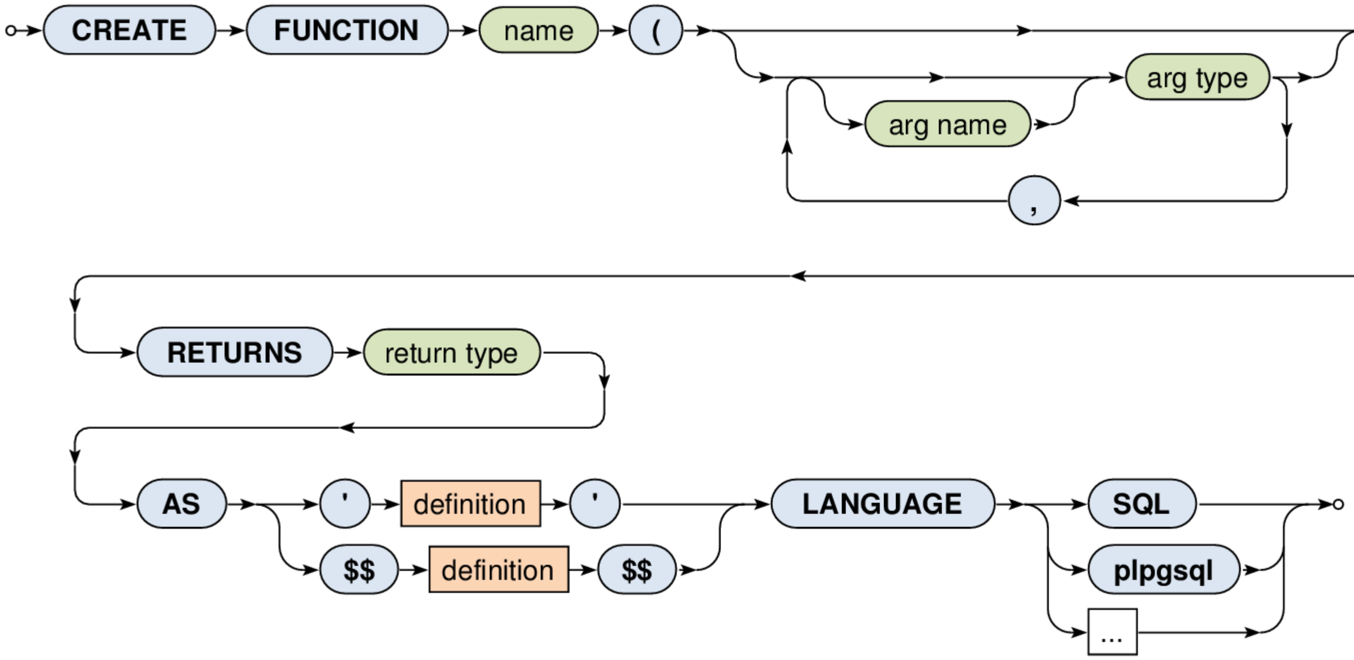
Exercise 7

- **Create an index** on a table of accounts
  - Construct this index such that it helps us with the effective evaluation of the previous query

- **Analyze the query evaluation plan** once again

Stored Procedures

- **CREATE FUNCTION** command



  - Arguments accessible via $1, $2, … when not named

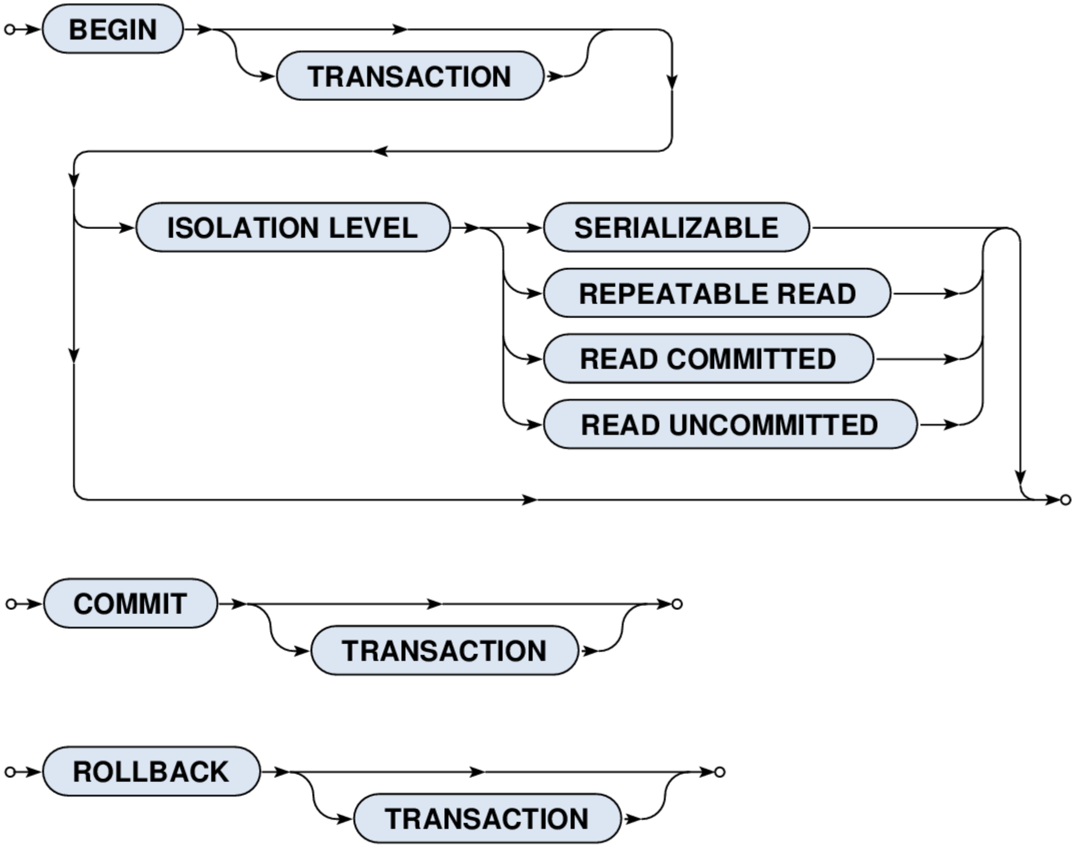
Exercise 8

- **Create a stored procedure for bank transfers**
  - Input arguments
    - Transfer identifier, source/target accounts, amount
  - Actions
    - Both accounts will be tested for their existence
    - The source account will be tested for sufficient balance
    - Balances of both the accounts will be updated
    - The transfer will be logged into the table of transfers
      - Current time will be used as a transfer timestamp

- **Execute this procedure** for a sample transfer

Transactions

- **BEGIN**, **COMMIT** and **ROLLBACK** commands

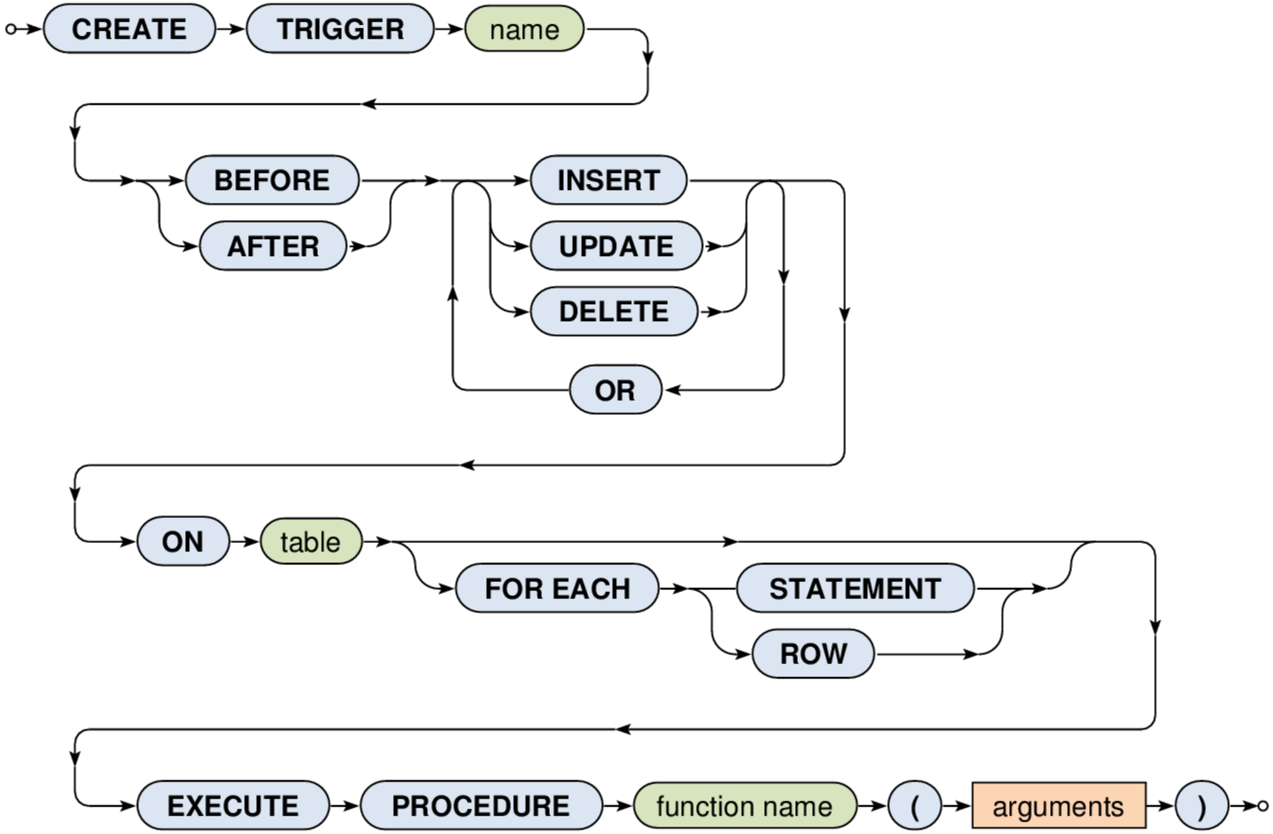


Exercise 9

- **Execute the previous procedure as a transaction**
  - I.e. encapsulate its call into a transaction

Triggers

- **CREATE TRIGGER** command



Exercise 10

- **Create a new trigger** that allows us to check validity of account balances
  - Invoke this trigger to check impact of all INSERT and UPDATE operations
  - Access old/new values via OLD/NEW records