Oracle PL/SQL Programming

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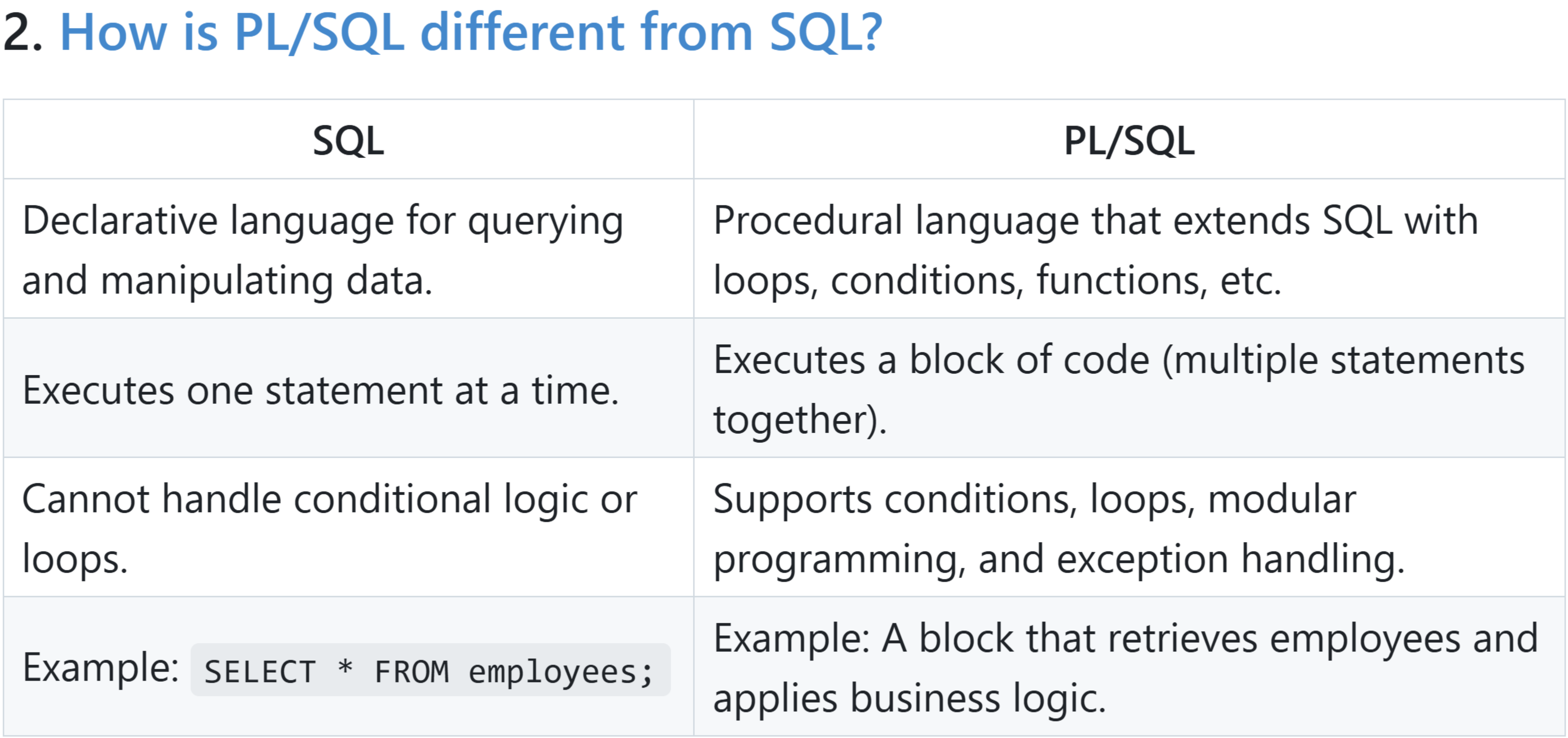
1. What is PL/SQL?

- **PL/SQL** stands for *Procedural Language/Structured Query Language*.
- It is Oracle’s procedural extension to SQL.
- SQL alone can retrieve, manipulate, and manage data, but **PL/SQL adds programming features** like loops, conditions, variables, and error handling.



2. How is PL/SQL different from SQL?

SQL	PL/SQL
Declarative language for querying and manipulating data.	Procedural language that extends SQL with loops, conditions, functions, etc.
Executes one statement at a time.	Executes a block of code (multiple statements together).
Cannot handle conditional logic or loops.	Supports conditions, loops, modular programming, and exception handling.
Example: `SELECT * FROM employees;`	Example: A block that retrieves employees and applies business logic.

3. Why do we need PL/SQL?

- To **combine SQL with programming features**.
- To improve **performance** (minimizing network calls by grouping SQL statements).
- To implement **business logic** inside the database.
- To handle **exceptions (errors)** gracefully.
- To create **procedures, functions, triggers, and packages** for reusable code.

4. PL/SQL Blocks

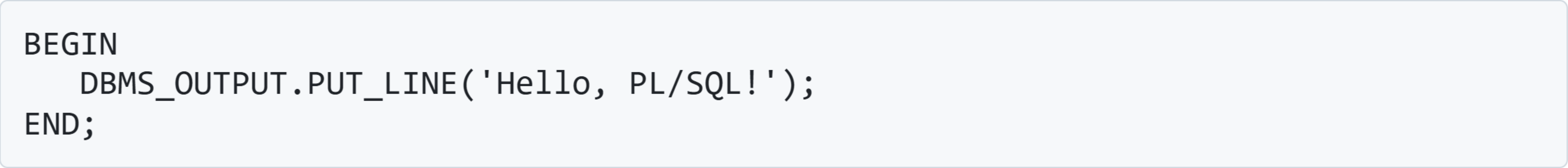
A **PL/SQL block** is the basic unit of code. It has three sections:

```
DECLARE
   -- Declarations (variables, constants)
BEGIN
   -- Executable statements (logic, SQL queries)
EXCEPTION
   -- Error handling
END;
```

- **Anonymous blocks**: executed directly, not stored in DB.
- **Named blocks**: stored as *procedures, functions, triggers, packages*.

Output Statement

Example:



```
BEGIN
   DBMS_OUTPUT.PUT_LINE('Hello, PL/SQL!');
END;
```

5. Variables, Constants, and Attributes in PL/SQL

Variables

- Used to store data temporarily.

```
DECLARE
   v_name VARCHAR2(50);
   v_salary NUMBER(10,2);
BEGIN
   v_name := 'John';
   v_salary := 5000;
   DBMS_OUTPUT.PUT_LINE(v_name || ' earns ' || v_salary);
END;
```

Constants

- Value cannot be changed once assigned.

```
DECLARE
   c_tax_rate CONSTANT NUMBER := 0.05;
BEGIN
   DBMS_OUTPUT.PUT_LINE('Tax Rate = ' || c_tax_rate);
END;
```

Attributes

- `%TYPE`: Use datatype of a column.

```
DECLARE
   v_empname employees.first_name%TYPE;
BEGIN
   SELECT first_name INTO v_empname FROM employees WHERE employee_id = 101;
   DBMS_OUTPUT.PUT_LINE(v_empname);
END;
```

- `%ROWTYPE`: Record with structure of a row.

```
DECLARE
   emp_record employees%ROWTYPE;
BEGIN
   SELECT * INTO emp_record FROM employees WHERE employee_id = 101;
   DBMS_OUTPUT.PUT_LINE(emp_record.first_name || ' ' || emp_record.salary);
END;
```

6. Collection Datatypes

Collections store multiple values.

1. **Associative Arrays (Index-by tables)**

```
DECLARE
   TYPE name_table IS TABLE OF VARCHAR2(50) INDEX BY PLS_INTEGER;
   v_names name_table;
BEGIN
   v_names(1) := 'Alice';
   v_names(2) := 'Bob';
   DBMS_OUTPUT.PUT_LINE(v_names(1));
END;
```