SE Comp A	Roll number : 9913
Experiment no. : 9	Date of Implementation : 26/ 03/ 2024

Aim : To implement Functions and Triggers

Tool Used : PostgreSQL

Related Course outcome : At the end of the course, Students will be able to Use SQL : Standard language of relational database

Rubrics for assessment of Experiment:

Indicator	Poor	Average	Good
Timeliness • Maintains assignment deadline (3)	Assignment not done (0)	One or More than One week late (1-2)	Maintains deadline (3)
Completeness and neatness • Complete all parts of assignment(3)	N/A	< 80% complete (1-2)	100% complete (3)
Originality • Extent of plagiarism(2)	Copied it from someone else(0)	At least few questions have been done without copying(1)	Assignment has been solved completely without copying (2)
Knowledge • In depth knowledge of the assignment(2)	Unable to answer 2 questions(0)	Unable to answer 1 question (1)	Able to answer 2 questions (2)

Assessment Marks :

Timeliness	
Completeness and neatness	
Originality	
Knowledge	
Total	

Total : **(Out of 10)**

Teacher's Sign :	
EXPERIMENT 09	***Functions and Triggers***
Aim	To implement PL/pgSQL function and trigger
Tools	PostgreSQL http://www.postgresqltutorial.com/postgresql-create-function/ http://www.postgresqltutorial.com/plpgsql-function-overloading/ http://www.postgresqltutorial.com/plpgsql-function-returns-a-table/ http://www.postgresqltutorial.com/creating-first-trigger-postgresql/ PostgreSQL: Documentation: 15: 43.10. Trigger Functions

Theory

CREATE FUNCTION defines a new function. CREATE OR REPLACE FUNCTION will either create a new function, or replace an existing definition. To be able to define a function, the user must have the USAGE privilege on the language.If a schema name is included, then the function is created in the specified schema. Otherwise it is created in the current schema. The name of the new function must not match any existing function with the same input argument types in the same schema. However, functions of different argument types can share a name (this is called *overloading*).

Syntax for Function

```
CREATE [ OR REPLACE ] FUNCTION
    name ( [ [ argmode ] [ argname ] argtype [ { DEFAULT | = } default_expr ] [,
...] ] )
   [ RETURNS rettype
     | RETURNS TABLE ( column_name column_type [, ...] ) ]
 { LANGUAGE lang_name
   | WINDOW
   | IMMUTABLE | STABLE | VOLATILE
   | CALLED ON NULL INPUT | RETURNS NULL ON NULL INPUT | STRICT
   | [ EXTERNAL ] SECURITY INVOKER | [ EXTERNAL ] SECURITY DEFINER
   | COST execution_cost
   | ROWS result_rows
   | SET configuration_parameter { TO value | = value | FROM CURRENT }
   | AS 'definition'
   | AS 'obj_file', 'link_symbol'
 } ...
   [ WITH ( attribute [, ...] ) ]
```

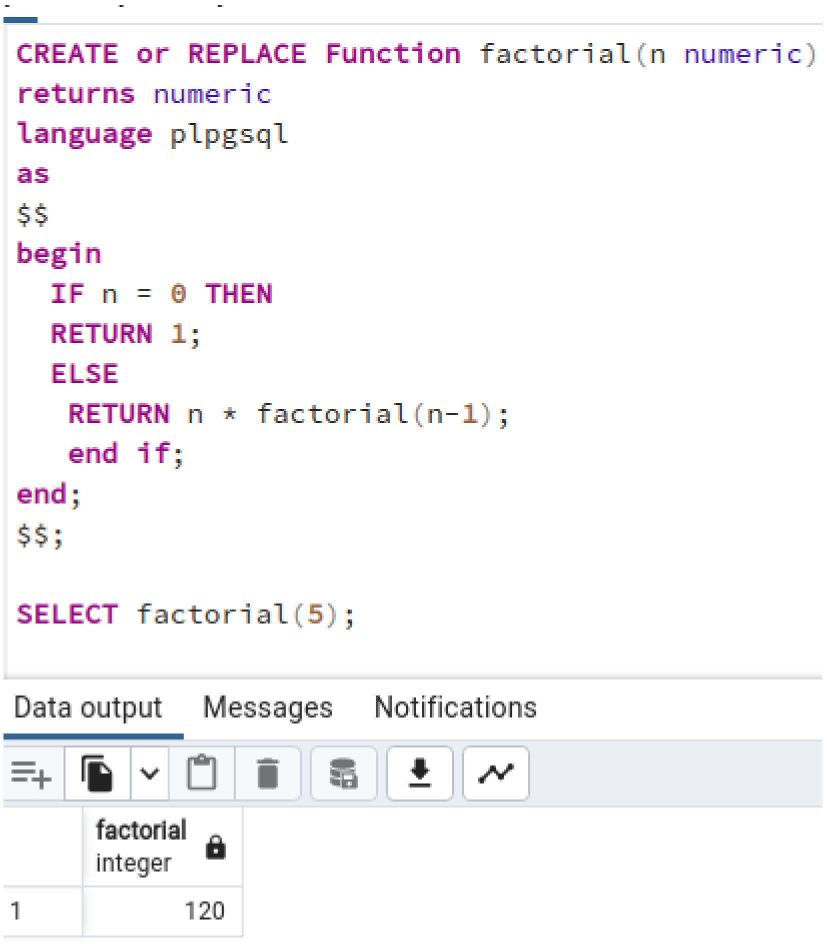
If you drop and then recreate a function, the new function is not the same entity as the old; you will have to drop existing rules, views, triggers, etc. that refer to the old function. Use CREATE OR REPLACE FUNCTION to change a function definition without breaking objects that refer to the function.

The trigger can be specified to fire before the operation is attempted on a row (before constraints are checked and the INSERT, UPDATE, or DELETE is attempted); or after the operation has completed (after constraints are checked and the INSERT, UPDATE, or DELETE has completed); or instead of the operation (in the case of inserts, updates or deletes on a view). If the trigger fires before or instead of the event, the trigger can skip the operation for the current row, or change the row being inserted (for INSERT and UPDATE operations only). If the trigger fires after the event, all changes, including the effects of other triggers, are "visible" to the trigger.

		Syntax of Trigger
		 CREATE [CONSTRAINT] TRIGGER name { BEFORE | AFTER | INSTEAD OF } { event [OR ...] }
		    ON table
		    [FROM referenced_table_name]
		     [NOT DEFERRABLE | [DEFERRABLE] { INITIALLY IMMEDIATE | INITIALLY DEFERRED }]
		    [FOR [EACH] { ROW | STATEMENT }]
		    [WHEN (condition)]
		    EXECUTE PROCEDURE function_name (arguments)
		
		where event can be one of:
		
		    INSERT
		    UPDATE [OF column_name [, ...]]
		    DELETE
		    TRUNCATE
		To create a trigger on a table, the user must have the TRIGGER privilege on the table. The user must also have EXECUTE privilege on the trigger function.
		Use DROP TRIGGER to remove a trigger.

AIM

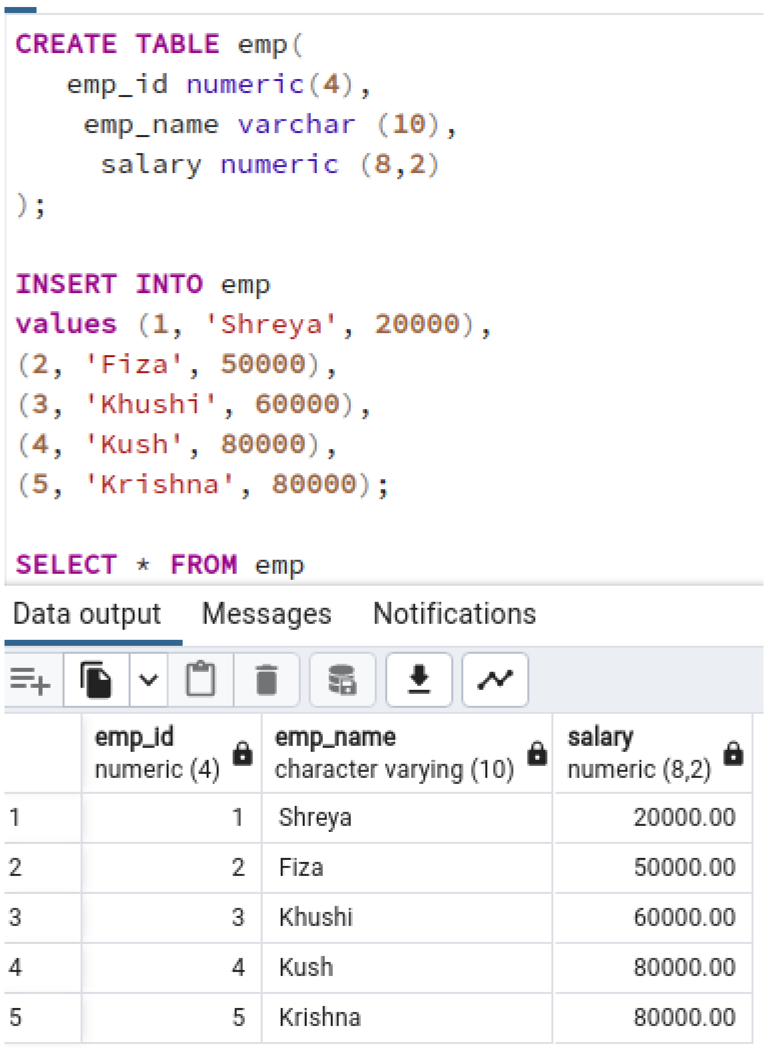
1. Write a function to find factorial of a number use it and write the observation for it.



```
CREATE or REPLACE Function factorial(n numeric)
returns numeric
language plpgsql
as
$$
begin
  IF n = 0 THEN
  RETURN 1;
  ELSE
   RETURN n * factorial(n-1);
   end if;
end;
$$;

SELECT factorial(5);
```

```
   factorial
   integer
1        120
```

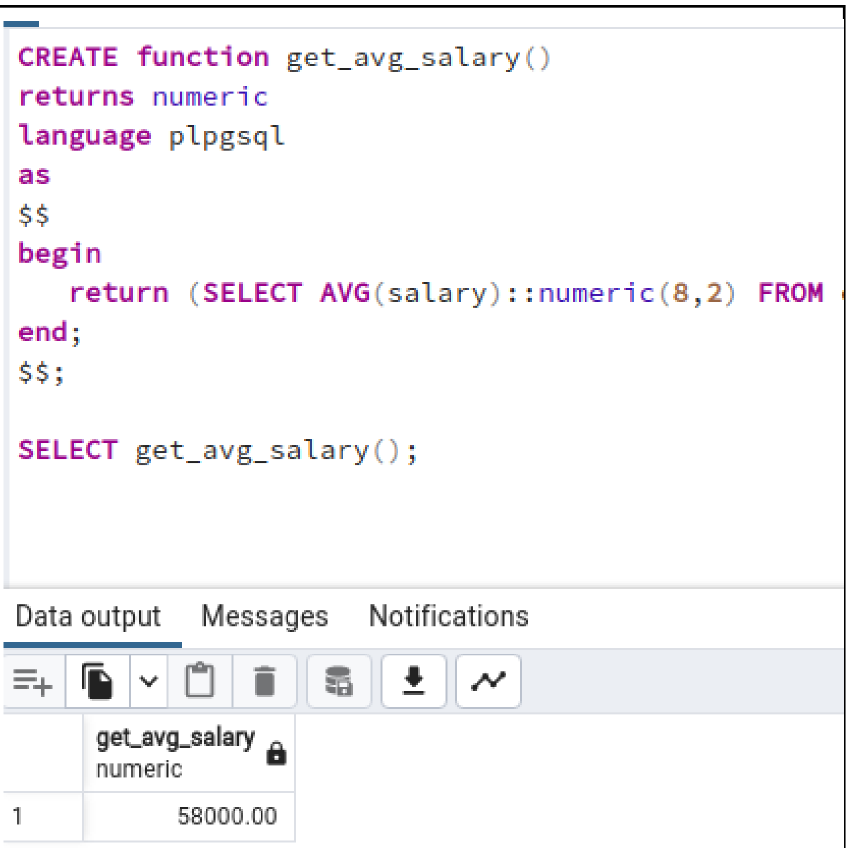
2. Create table emp(id,name,salary) and insert 3 records in it.



```
CREATE TABLE emp(
   emp_id numeric(4),
    emp_name varchar (10),
     salary numeric (8,2)
);

INSERT INTO emp
values (1, 'Shreya', 20000),
(2, 'Fiza', 50000),
(3, 'Khushi', 60000),
(4, 'Kush', 80000),
(5, 'Krishna', 80000);

SELECT * FROM emp
```

	emp_id numeric (4)	emp_name character varying (10)	salary numeric (8,2)
1	1	Shreya	20000.00
2	2	Fiza	50000.00
3	3	Khushi	60000.00
4	4	Kush	80000.00
5	5	Krishna	80000.00

3. Write a function find average salary from emp table

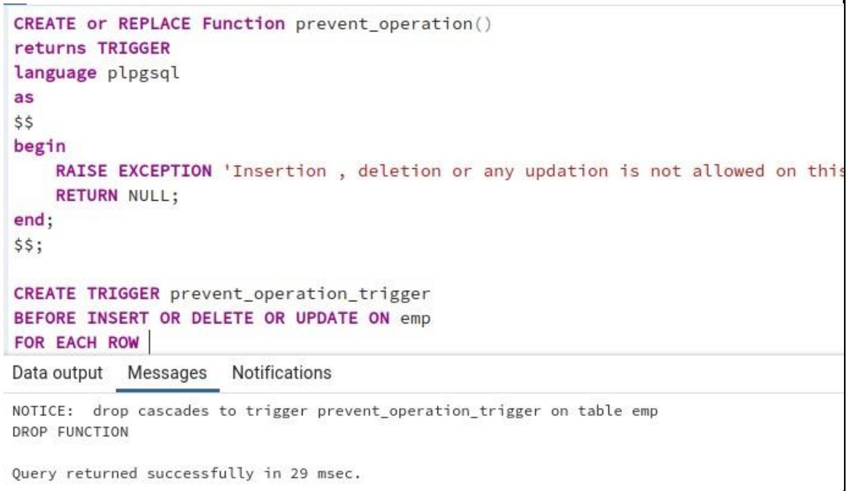


```
CREATE function get_avg_salary()
returns numeric
language plpgsql
as
$$
begin
    return (SELECT AVG(salary)::numeric(8,2) FROM
end;
$$;

SELECT get_avg_salary();
```

Data output   Messages   Notifications

```
   get_avg_salary
   numeric
1        58000.00
```

4. Write a row level trigger that would fire before insert/ update/delete operations performed on emp table, not allowing these operations and display the appropriate message.

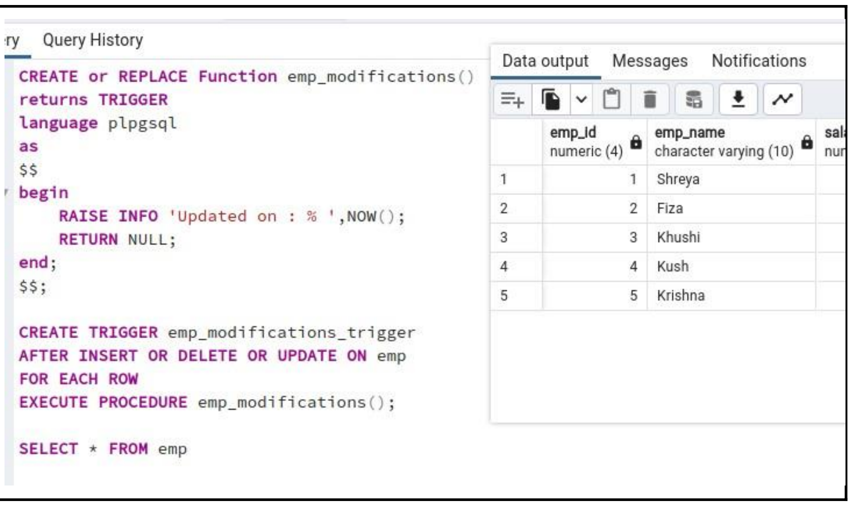


```
CREATE or REPLACE Function prevent_operation()
returns TRIGGER
language plpgsql
as
$$
begin
    RAISE EXCEPTION 'Insertion , deletion or any updation is not allowed on this
    RETURN NULL;
end;
$$;

CREATE TRIGGER prevent_operation_trigger
BEFORE INSERT OR DELETE OR UPDATE ON emp
FOR EACH ROW
```

Data output   Messages   Notifications

```
NOTICE:  drop cascades to trigger prevent_operation_trigger on table emp
DROP FUNCTION

Query returned successfully in 29 msec.
```

5. Write a row level trigger that would fire after insert/update/delete operations performed on emp table displaying date on which data manipulation performed.



```
CREATE or REPLACE Function emp_modifications()
returns TRIGGER
language plpgsql
as
$$
begin
    RAISE INFO 'Updated on : % ',NOW();
    RETURN NULL;
end;
$$;

CREATE TRIGGER emp_modifications_trigger
AFTER INSERT OR DELETE OR UPDATE ON emp
FOR EACH ROW
EXECUTE PROCEDURE emp_modifications();

SELECT * FROM emp
```

	emp_id numeric (4)	emp_name character varying (10)	sal nu
1	1	Shreya	
2	2	Fiza	
3	3	Khushi	
4	4	Kush	
5	5	Krishna	

Post Lab Questions:

1. Explain syntax of function in Mysql /PostgreSQL with example

⇒ The general structure of mysql function is:

```
DELIMITER //
CREATE FUNCTION function_name(parameter INT) RETURNS
INT
BEGIN
   DECLARE variable_name INT;
   -- Function logic
   RETURN variable_name;
END;
//
DELIMITER ;
```

Here is an example of creating a function in MySQL:

```
DELIMITER //
CREATE FUNCTION CalcIncome (starting_value INT) RETURNS
INT
BEGIN
   DECLARE income INT;
   SET income = 0;
   label1: WHILE income <= 3000 DO
      SET income = income + starting_value;
   END WHILE label1;
   RETURN income;
END;
//
DELIMITER ;
```

The general structure of a function in postgresql is:

```
CREATE FUNCTION somefunc(integer, text) RETURNS integer AS
$$
DECLARE
   -- Local variables declaration
BEGIN
   -- Function logic
END;
$$
 LANGUAGE plpgsql;
```

Here is an example of creating a function in PostgreSQL:

```
CREATE FUNCTION totalRecords() RETURNS integer AS $total$
DECLARE
   total integer;
BEGIN
   SELECT count(*) INTO total FROM COMPANY;
   RETURN total;
```

```
END;
$total$ LANGUAGE plpgsql;
```

2. Explain trigger example with syntax in Mysql/postgreSQL.

⇒ **MySQL Trigger Example:**

In MySQL, to create a trigger, you use the CREATE TRIGGER statement. Below is an example of a trigger that updates a timestamp column whenever a row is inserted into a table:

sql

```
CREATE TRIGGER update_timestamp
BEFORE INSERT ON table_name
FOR EACH ROW
SET NEW.timestamp_column = NOW();
```

- Explanation:
  - CREATE TRIGGER: Initiates the trigger creation.
  - update_timestamp: Name of the trigger.
  - BEFORE INSERT ON table_name: Specifies the trigger to execute before an insert operation on a specific table.
  - FOR EACH ROW: Indicates that the trigger should be executed for each row affected by the operation.

SET NEW.timestamp_column = NOW(): Sets the timestamp_column to the current timestamp when a new row is inserted.

PostgreSQL Trigger Example:

In PostgreSQL, triggers are created using the CREATE TRIGGER statement. Here is an example of a trigger that logs changes made to a specific column in a table:

```
CREATE TRIGGER log_changes
AFTER UPDATE OF column_name ON table_name
FOR EACH ROW
EXECUTE FUNCTION log_update();
```

<u>Explanation:</u>

- CREATE TRIGGER: Starts the trigger creation.
- log_changes: Name of the trigger.
- AFTER UPDATE OF column_name ON table_name: Specifies the trigger to execute after an update operation on a specific column in a table.
- FOR EACH ROW: Indicates that the trigger should be executed for each row affected by the operation.
- EXECUTE FUNCTION log_update(): Calls the log_update function to log the changes made.