NAME: LAKSHMI PRIYA
ROLL.NO:231901025

Date: 07-11-2024

Ex.no: 13 **WORKING WITH TRIGGER**

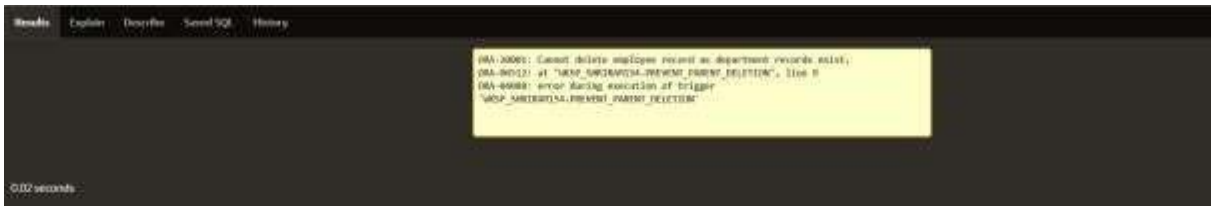
Program 1

Write a code in PL/SQL to develop a trigger that enforces referential integrity by preventing the deletion of a parent record if child records exist.

```
CREATE OR REPLACE TRIGGER prevent_parent_deletion
BEFORE DELETE ON employees
FOR EACH ROW
DECLARE      pl_dept_count NUMBER;
BEGIN SELECT
COUNT(*)
    INTO pl_dept_count
    FROM department
    WHERE dept_id = :OLD.employee_id;
    IF pl_dept_count > 0 THEN
        RAISE_APPLICATION_ERROR(-20001, 'Cannot delete employee record as  department
records exist.'); END IF;
END;



DELETE FROM employees
WHERE employee_id = 70;
```



```
ORA-20001: Cannot delete employee record as department records exist;
ORA-06512: at "WKSP_SHRIRAM154.PREVENT_PARENT_DELETION", line 8
ORA-04088: error during execution of trigger
'WKSP_SHRIRAM154.PREVENT_PARENT_DELETION'
```

0.02 seconds

Program 2

Write a code in PL/SQL to create a trigger that checks for duplicate values in a specific column and raises an exception if found.

```
CREATE OR REPLACE TRIGGER prevent_duplicate_manager_id
BEFORE INSERT OR UPDATE ON employees
FOR EACH ROW
DECLARE     pl_count
NUMBER; BEGIN
    SELECT COUNT(*)
    INTO pl_count
    FROM employees
    WHERE manager_id = :NEW.manager_id AND employee_id
    != :NEW.employee_id;
    IF pl_count > 0 THEN
        RAISE_APPLICATION_ERROR(-20003, 'Duplicate manager_id found: ' ||
:NEW.manager_id); END
   IF;
END;
INSERT INTO employees (employee_id, first_name, last_name, email, phone_number,
hire_date, job_id, salary, commission_pct, manager_id, department_id)
VALUES (202, 'Jane', 'Smith',
'john006@gmail.com',7383922241,'11/9/2000','ST_CLERK',10000,0.15,400,80);
```

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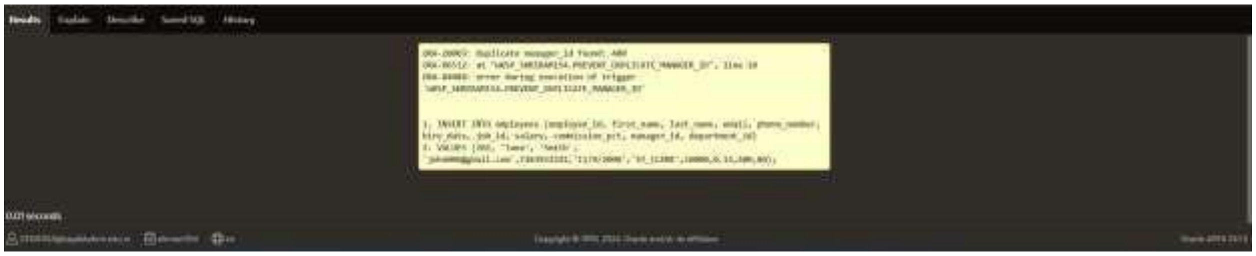


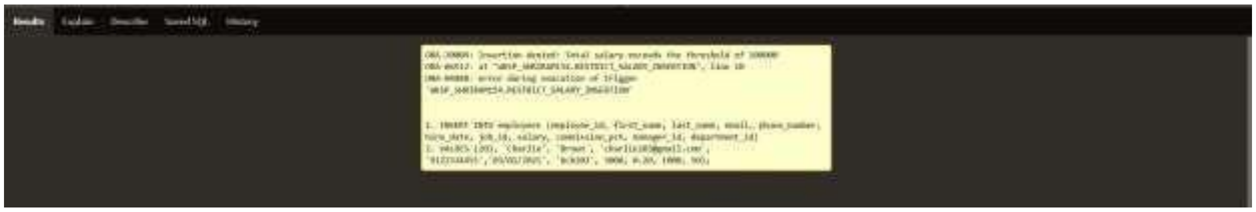
```
ORA-20003: Duplicate manager_id found: 400
ORA-06512: at "WKSP_SHRIRAM154.PREVENT_DUPLICATE_MANAGER_ID", line 10
ORA-04088: error during execution of trigger
'WKSP_SHRIRAM154.PREVENT_DUPLICATE_MANAGER_ID'

1. INSERT INTO employees (employee_id, first_name, last_name, email, phone_number,
hire_date, job_id, salary, commission_pct, manager_id, department_id)
2. VALUES (202, 'Jane', 'Smith',
'[illegible]@gmail.com',[illegible],'[illegible]','[illegible]',[illegible]);

0.01 seconds
```

Program 3

Write a code in PL/SQL to create a trigger that restricts the insertion of new rows if the total of a column's values exceeds a certain threshold.

```
CREATE OR REPLACE TRIGGER restrict_salary_insertion
BEFORE INSERT ON employees
FOR EACH ROW
DECLARE  total_salary NUMBER; threshold
   NUMBER
:= 100000; BEGIN

    SELECT SUM(salary)
    INTO total_salary
    FROM employees;
    IF (total_salary + :NEW.salary) > threshold THEN
         RAISE_APPLICATION_ERROR(-20004, 'Insertion denied: Total salary exceeds the
threshold of ' || threshold); END IF;
END;
INSERT INTO employees (employee_id, first_name, last_name, email, phone_number,
hire_date, job_id, salary, commission_pct, manager_id, department_id)
```

VALUES (203, 'Charlie', 'Brown', 'charlie203@gmail.com', '9122334455','03/01/2021', '#cb203', 5000, 0.20, 1000, 50);

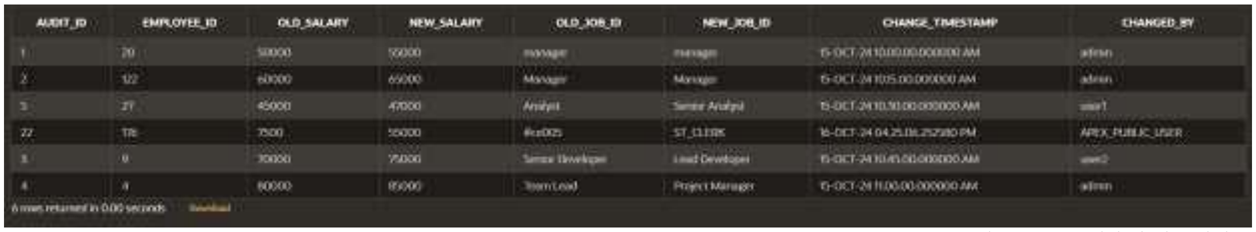


```
ORA-20001: Insertion denied: Total salary exceeds the threshold of 100000
ORA-06512: at "[illegible].RESTRICT_SALARY_INSERTION", line 10
ORA-04088: error during execution of trigger
'[illegible].RESTRICT_SALARY_INSERTION'


1. INSERT INTO employees (employee_id, first_name, last_name, email, phone_number,
hire_date, job_id, salary, commission_pct, manager_id, department_id)
2. VALUES (203, 'Charlie', 'Brown', 'charlie203@gmail.com',
'9122334455','03/01/2021', '#cb203', 5000, 0.20, 1000, 50);
```

Program 4

Write a code in PL/SQL to design a trigger that captures changes made to specific columns and logs them in an audit table.

```
CREATE OR REPLACE TRIGGER audit_changes
AFTER UPDATE OF salary, job_id ON employees
FOR EACH ROW
BEGIN
   IF :OLD.salary != :NEW.salary OR :OLD.job_id != :NEW.job_id THEN
      INSERT INTO employee_audit ( employee_id,  old_salary,
```



AUDIT_ID	EMPLOYEE_ID	OLD_SALARY	NEW_SALARY	OLD_JOB_ID	NEW_JOB_ID	CHANGE_TIMESTAMP	CHANGED_BY
1	20	50000	55000	manager	manager	15-OCT-24 10.00.00.000000 AM	admin
2	122	60000	65000	Manager	Manager	15-OCT-24 10.15.00.000000 AM	admin
3	27	45000	47000	Analyst	Senior Analyst	15-OCT-24 10.30.00.000000 AM	user1
22	178	7500	55000	#cs005	ST_CLERK	16-OCT-24 04.25.06.252980 PM	APEX_PUBLIC_USER
3	9	70000	75000	Senior Developer	Lead Developer	15-OCT-24 10.45.00.000000 AM	user2
4	4	80000	85000	Team Lead	Project Manager	15-OCT-24 11.00.00.000000 AM	admin

6 rows returned in 0.00 seconds Download

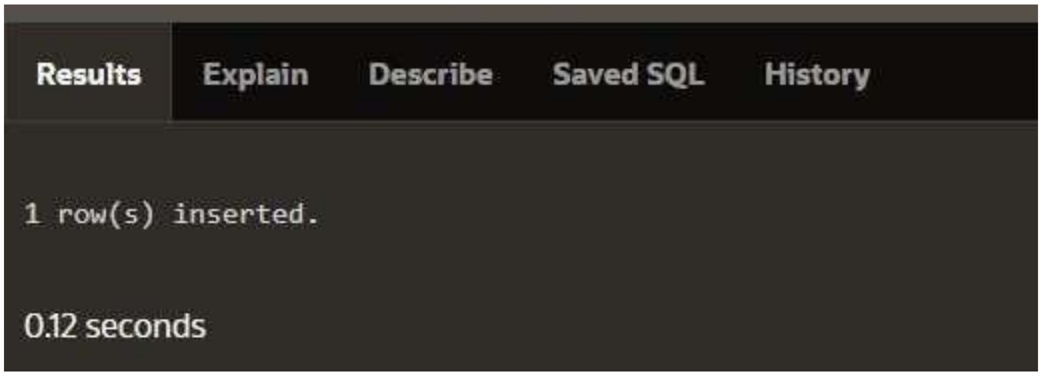
```
                                                    new_salary,     old_job_title,
      new_job_title,
      change_timestamp, changed_by )
      VALUES (
         :OLD.employee_id,
         :OLD.salary,
         :NEW.salary,
         :OLD.job_id,
            :NEW.job_id,
            SYSTIMESTAMP,
            USER
        );
    END IF;
END;


UPDATE employees
SET salary = 55000, job_id = 'ST_CLERK'
WHERE employee_id = 176;


SELECT * FROM employee_audit;
```

Program 5

Implement a trigger that records user activity (inserts, updates, deletes) in an audit log for a given set of tables.

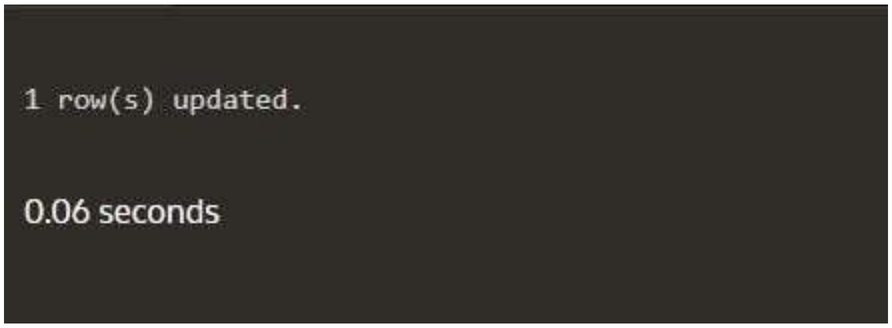
```
CREATE OR REPLACE TRIGGER trg_audit_employees
AFTER INSERT OR UPDATE OR DELETE ON employees
FOR EACH ROW
DECLARE v_old_values
   CLOB; v_new_values
   CLOB;
BEGIN
   IF INSERTING THEN v_old_values := NULL; v_new_values :=
    'employee_id: ' || :NEW.employee_id || ', ' ||
                'first_name: ' || :NEW.first_name || ', ' ||
                'salary: ' || :NEW.salary;

    INSERT INTO audit_log (action, table_name, record_id, changed_by, new_values)
    VALUES ('INSERT', 'employees', :NEW.employee_id, USER, v_new_values);

  ELSIF UPDATING THEN
    v_old_values := 'employee_id: ' || :OLD.employee_id || ', ' ||
                'first_name: ' || :OLD.first_name || ', ' ||
                'salary:    '    ||    :OLD.salary;    v_new_values    :=
    'employee_id: ' || :NEW.employee_id || ', ' ||
                'first_name: ' || :NEW.first_name || ', ' ||
                'salary: ' || :NEW.salary;

    INSERT INTO audit_log (action, table_name, record_id, changed_by, old_values,
new_values)
```

```
VALUES ('UPDATE', 'employees', :NEW.employee_id, USER, v_old_values, v_new_values);

  ELSIF DELETING THEN
     v_old_values := 'employee_id: ' || :OLD.employee_id || ', ' ||
                 'first_name: ' || :OLD.first_name || ', ' ||
                 'salary: ' || :OLD.salary; v_new_values :=
     NULL;

     INSERT INTO audit_log (action, table_name, record_id, changed_by, old_values)
     VALUES ('DELETE', 'employees', :OLD.employee_id, USER, v_old_values); END
  IF;
END trg_audit_employees;

INSERT INTO employees (employee_id, first_name, salary)
VALUES (3, 'Ball', 50000);
```



```
1 row(s) inserted.

0.12 seconds
```

```
UPDATE employees
SET salary = 55000
WHERE employee_id = 3;
```

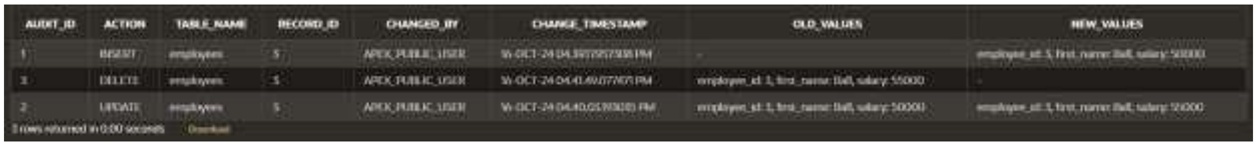


```
1 row(s) updated.

0.06 seconds
```

DELETE FROM employees WHERE employee_id

= 3;

SELECT * FROM audit_log;



AUDIT_ID	ACTION	TABLE_NAME	RECORD_ID	CHANGED_BY	CHANGE_TIMESTAMP	OLD_VALUES	NEW_VALUES
1	INSERT	employees	5	APEX_PUBLIC_USER	16-OCT-24 [illegible] PM	-	employee_id: 5, first_name: Ball, salary: 50000
3	DELETE	employees	5	APEX_PUBLIC_USER	16-OCT-24 04.41.49.077471 PM	employee_id: 3, first_name: Ball, salary: 55000	-
2	UPDATE	employees	5	APEX_PUBLIC_USER	16-OCT-24 04.40.0[illegible] PM	employee_id: 3, first_name: Ball, salary: 50000	employee_id: 3, first_name: Ball, salary: 55000

3 rows returned in 0.00 seconds Download

Program 7

Implement a trigger that automatically calculates and updates a

running total column for a table whenever new rows are inserted.

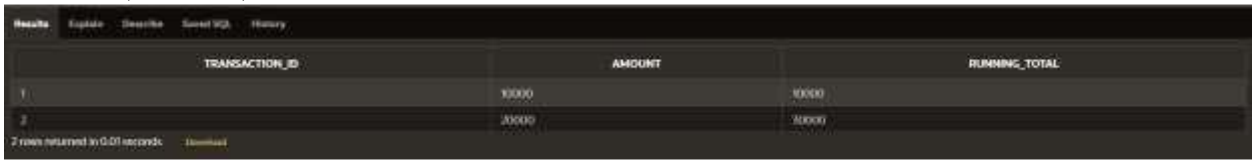
```
CREATE         TABLE           transactions  (
    transaction_id NUMBER PRIMARY KEY, amount
            NUMBER,      running_total
    NUMBER
);

CREATE OR REPLACE TRIGGER update_running_total
FOR INSERT ON transactions
COMPOUND TRIGGER
```

```
    TYPE amount_array IS TABLE OF NUMBER INDEX BY PLS_INTEGER; new_amounts
    amount_array;

    BEFORE EACH ROW IS
    BEGIN           new_amounts(:NEW.transaction_id)           :=
      :NEW.amount;
    END BEFORE EACH ROW;

    AFTER STATEMENT IS
    BEGIN
      DECLARE         v_total
        NUMBER;
      BEGIN
        SELECT NVL(MAX(running_total), 0)
        INTO v_total
        FROM transactions;

        FOR i IN new_amounts.FIRST .. new_amounts.LAST LOOP v_total :=
          v_total + new_amounts(i); UPDATE transactions
          SET running_total = v_total
          WHERE transaction_id = i;
        END LOOP;
      END;
    END AFTER STATEMENT;

  END update_running_total;
  INSERT INTO transactions (transaction_id, amount) VALUES
```

(1, 10000);

INSERT INTO transactions (transaction_id, amount)

VALUES (2, 20000);



TRANSACTION_ID	AMOUNT	RUNNING_TOTAL
1	10000	10000
2	20000	30000

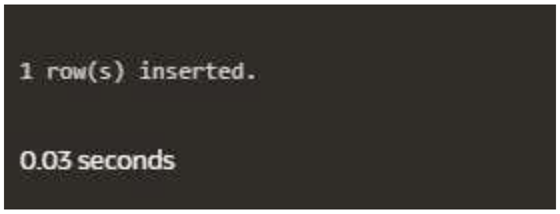
2 rows returned in 0.01 seconds Download

Program 8

create a trigger that validates the availability of items before allowing an

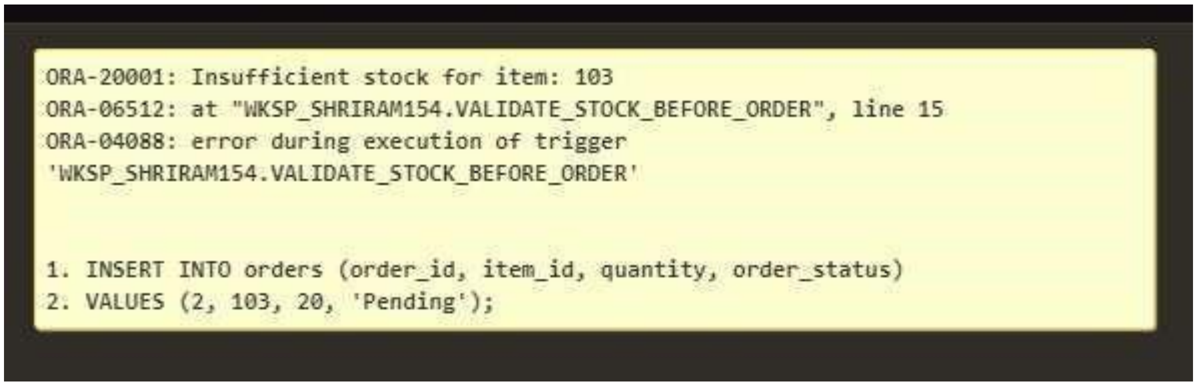
order to be placed, considering stock levels and pending orders.

```
CREATE TABLE inventory ( item_id NUMBER PRIMARY KEY, item_name
VARCHAR2(100), stock_level NUMBER


);


CREATE TABLE orders ( order_id NUMBER
   PRIMARY KEY, item_id NUMBER,
         quantity          NUMBER,
   order_status VARCHAR2(20),
    CONSTRAINT fk_item FOREIGN KEY (item_id) REFERENCES inventory(item_id)
);




CREATE        OR        REPLACE
    TRIGGER
   validate_stock_before_order
BEFORE        INSERT         ON
   ordersDECLARE v_stock_level
         NUMBER;
   v_pending_orders NUMBER;
BEGIN
    SELECT stock_level
    INTO v_stock_level
    FROM inventory
    WHERE item_id = :NEW.item_id;
    SELECT NVL(SUM(quantity), 0)
    INTO v_pending_orders
    FROM orders
    WHERE item_id = :NEW.item_id
      AND order_status = 'Pending';
    IF (:NEW.quantity + v_pending_orders) > v_stock_level THEN
          RAISE_APPLICATION_ERROR(-20001, 'Insufficient stock for item: ' || :NEW.item_id);
    END IF;
END;
INSERT INTO orders (order_id, item_id, quantity, order_status) VALUES (1, 101,
5, 'Pending');
```

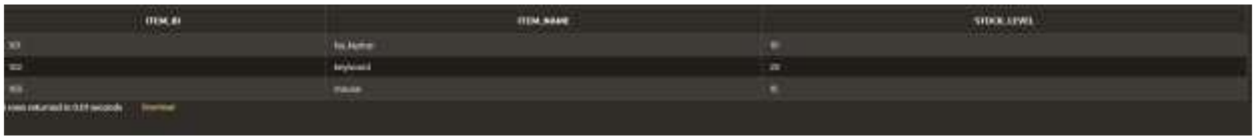


```
1 row(s) inserted.

0.03 seconds
```

```
INSERT INTO orders (order_id, item_id, quantity, order_status)
VALUES (2, 103, 20, 'Pending');
```

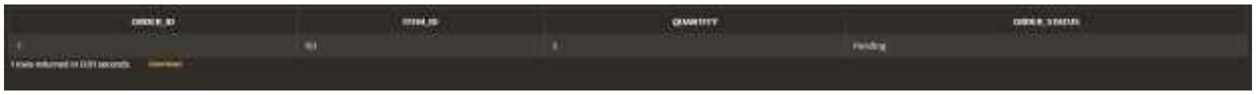


```
ORA-20001: Insufficient stock for item: 103
ORA-06512: at "WKSP_SHRIRAM154.VALIDATE_STOCK_BEFORE_ORDER", line 15
ORA-04088: error during execution of trigger
'WKSP_SHRIRAM154.VALIDATE_STOCK_BEFORE_ORDER'


1. INSERT INTO orders (order_id, item_id, quantity, order_status)
2. VALUES (2, 103, 20, 'Pending');
```



ITEM_ID	ITEM_NAME	STOCK_LEVEL
101	[illegible]	[illegible]
102	Keyboard	20
103	mouse	[illegible]

3 rows returned in 0.01 seconds Download



ORDER_ID	ITEM_ID	QUANTITY	ORDER_STATUS
1	101	5	Pending

1 rows returned in 0.01 seconds Download