

```

USE retail_banking_analytics;

-- MODULE 3
-- Fraud & Transaction Risk Analysis

-- Task 1
-- Identify unusually large withdrawals relative to historical customer behavior

-- Computing average transaction size per account
SELECT
    account_id,
    AVG(ABS(amount)) AS avg_txn_amount -- withdrawal may be negative
FROM transactions
GROUP BY account_id;

```

| account_id | avg_txn_amount |
|------------|----------------|
| 103762 | 33417.065000 |
| 101226 | 93731.484000 |
| 111034 | 34302.303333 |
| 113887 | 37689.863333 |
| 109697 | 44276.300000 |
| 107197 | 26597.970000 |
| 112727 | 73117.763333 |
| 106391 | 69561.330000 |
| 111732 | 28839.962500 |

```

-- Flag unusually large withdrawals
-- i.e. A transaction > 3 x account's average transaction size
SELECT
    t.transaction_id,
    t.account_id,
    t.transaction_date,
    t.amount,
    a.avg_txn_amount
FROM transactions t
JOIN (
    SELECT

```

```

        account_id,
        AVG(ABS(amount)) AS avg_txn_amount
    FROM transactions
    GROUP BY account_id
) a
    ON t.account_id = a.account_id
WHERE t.amount < 0
    AND ABS(t.amount) > 3 * a.avg_txn_amount;

```

-- Task 2

-- Fraud distribution by transaction channel

```

SELECT
    t.channel,
    COUNT(f.transaction_id) AS confirmed_fraud_count
FROM transactions t
LEFT JOIN fraud_flags f
    ON t.transaction_id = f.transaction_id
    AND f.status = 'Confirmed'
GROUP BY t.channel
ORDER BY confirmed_fraud_count DESC;

```

| channel | confirmed_fraud_count |
|---------|-----------------------|
| Mobile | 183 |
| POS | 148 |
| ATM | 127 |
| Branch | 40 |

-- Task 3

-- Fraud rate by channel (CORRECT denominator logic)

```

SELECT
    t.channel,
    COUNT(*) AS total_transactions,
    SUM(

```

```

CASE
    WHEN f.status = 'Confirmed' THEN 1
    ELSE 0
END
) AS fraud_transactions,
ROUND(
    SUM(
        CASE
            WHEN f.status = 'Confirmed' THEN 1
            ELSE 0
        END
    ) / COUNT(*) * 100,
    2
) AS fraud_rate_pct
FROM transactions t
LEFT JOIN fraud_flags f
    ON t.transaction_id = f.transaction_id
GROUP BY t.channel
ORDER BY fraud_rate_pct DESC;

```

| channel | total_transactions | fraud_transactions | fraud_rate_pct |
|---------|--------------------|--------------------|----------------|
| Mobile | 17565 | 183 | 1.04 |
| ATM | 12581 | 127 | 1.01 |
| POS | 14936 | 148 | 0.99 |
| Branch | 4918 | 40 | 0.81 |

-- Task 4

-- Accounts with repeated confirmed fraud

```

SELECT
    t.account_id,
    COUNT(*) AS fraud_count
FROM transactions t
JOIN fraud_flags f
    ON t.transaction_id = f.transaction_id

```

```
WHERE f.status = 'Confirmed'  
GROUP BY t.account_id  
HAVING COUNT(*) > 1  
ORDER BY fraud_count DESC;
```

| account_id | fraud_count |
|------------|-------------|
| 112806 | 2 |
| 107379 | 2 |
| 106910 | 2 |
| 101554 | 2 |
| 111665 | 2 |
| 106469 | 2 |
| 102497 | 2 |
| 108453 | 2 |
| 100198 | 2 |
| 110522 | 2 |
| 112781 | 2 |
| 105940 | 2 |