

Let R be a table in a SQL Server database with schema R[RID, A1, K2, A2, A3, A4, A5, A6]. The primary key is {RID}; {K2} is a candidate key. All columns are nullable, except for RID and K2. Answer questions 1-3 using the legal instance below (each question has at least one correct answer).

RID	A1	K2	A2	A3	A4	A5	A6
2	Punctu-acela de miscare, mult mai slab ca boaba spumii,	100	1	3	3	M1	22
3	E stapanul fara margini peste marginile lumii...	200	1	3	3	M1	22
4	De-atunci negura eterna se desface in fasii,	150	2	3	4	M1	23
5	De atunci rasare lumea, luna, soare si stihii...	700	2	4	4	M2	29
6	De atunci si pana astazi colonii de lumi pierdute	300	3	4	5	M2	29
7	Vin din sure vai de chaos pe carari necunoscute	350	3	4	5	M5	23
8	Si in roiuri luminoase izvorand din infinit,	400	3	5	7	M5	29
9	Sunt atrase in viata de un dor nemarginit.	500	4	5	7	M2	30
10	Iar in lumea asta mare, noi copii ai lumii mici,	450	4	5	7	M7	30
11	Facem pe pamantul nostru musunoaie de furnici;	250	4	6	7	M7	30
12	Microscopice popoare, regi, osteni si invatati	800	5	6	7	M6	22
13	Ne succedem generatii si ne credem minunati;	750	5	6	7	M6	23

1. Consider query Q below:

```
SELECT r1.RID, r1.K2, COUNT(*) NumRows
FROM R r1 INNER JOIN R r2 ON r1.A2 = r2.A3
INNER JOIN R r3 ON r2.A3 = r3.A4
WHERE r1.A1 LIKE '_%'
GROUP BY r1.RID, r1.K2
HAVING COUNT(*) >= 6
```

- a. Q returns 8 records and tuples <10, 450, 6> and <12, 800, 6> are in its result set.
- b. Q returns 8 records and tuple <8, 400, 6> is in its result set.
- c. Q returns 2 records and tuples <10, 450, 6> and <12, 500, 12> are in its result set.
- d. Q returns 2 records and tuple <12, 500, 12> is in its result set.
- e. None of the above answers is correct.

* Note: in the above answers, the schema of a tuple is [RID, K2, NumRows].

2. How many records does the following query return?

```
SELECT r1.A6, MAX(r1.A2) MaxA2
FROM R r1
WHERE r1.A5 IN ('M1', 'M2')
GROUP BY r1.A6
EXCEPT
SELECT DISTINCT r2.A6, r2.A2
FROM R r2
```

- a. 2
- b. 3
- c. 4

d. 5

e. None of the above answers is correct.

3. The following objects are created in the same database: trigger TrOnInsert on table R (R's only trigger), function ufF1, table InsertLog[A5Value, NumRows, DateTimeOp].

```
CREATE OR ALTER FUNCTION ufF1(@A5 CHAR(2))
RETURNS INT
BEGIN
RETURN
  (SELECT COUNT(*)
   FROM R
   WHERE A5 = @A5)
END
```

```
CREATE OR ALTER TRIGGER TrOnInsert
ON R
FOR INSERT
AS
  INSERT InsertLog(A5Value, NumRows, DateTimeOp)
  SELECT i.A5, dbo.ufF1(i.A5), GETDATE()
  FROM inserted i
```

Table InsertLog is empty. How many records will InsertLog contain after executing the INSERT statements below?

```
INSERT R(RID, K2, A5) VALUES
  (14, 14, 'M1'), (15, 15, 'M1'), (16, 16, 'M2')
INSERT R(RID, K2, A5) VALUES
  (17, 17, 'M1'), (18, 18, 'M3')
```

a. 5

b. 3

c. 1

d. 0

e. None of the above answers is correct.

II

Create a database for a drone delivery startup that distributes pizzas via drones. The startup has partnerships with several drone manufacturers and pizza shops. The entities of interest to the problem domain are: Drone Manufacturers, Drone Models, Drones, Pizza Shops, Customers, and Deliveries. A drone manufacturer has a name and can produce different drone models. A drone model belongs to a drone manufacturer; it has a name, battery life (in minutes, integer number) and maximum speed. An actual drone is of a particular model and has a serial number. A pizza shop has a name and address. A customer has a name and loyalty score. Pizza shop names and customer names are unique. For each delivery, the system records the corresponding customer and pizza shop, the drone that is used, as well as the date and time.

a. Write an SQL script that creates the corresponding relational data model.

b. Implement a stored procedure that receives a customer, a pizza shop, a drone, a date and time and adds the corresponding delivery to the database.

c. Create a view that shows the names of the startup's favorite drone manufacturers, i.e., those with the largest number of drones used by the startup.

Example: suppose the startup has partnerships with 3 manufacturers: M1, M2, M3; it has 10 drones from M1, 10 drones from M2, and 8 drones from M3. M1 and M2 are the manufacturers with the largest number of drones.

d. Implement a function that lists the names of the customers who received at least ***D*** deliveries, where ***D*** is a function parameter.

- I. 1 1p
- 2 1p
- 3 1p
- II. a 2p
- b 1p
- c 2p
- d 1p