

CS 1555 HW 4

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1. (a) Arity = 1, Min = 1, Max = 1

$$\begin{aligned} J &\leftarrow \sigma_{start_timestamp \geq '2019-08-01 \ 00:00:00' \wedge start_timestamp < '2019-09-01 \ 00:00:00'}(RECORDS) \\ PA &\leftarrow J \bowtie_{from_pn=cell_pn} (\sigma_{state='PA'} DIRECTORY) \\ RSLT &\leftarrow F_{max(Duration)} PA \end{aligned}$$

- (b) Arity = 2 (zip, avg(payment_count)), Min = 0 (if there are no statements in Nov 2019), Max = 50 (50 different zip codes)

$$\begin{aligned} S &\leftarrow \sigma_{start_date \geq '2019-11-01 \ 00:00:00' \wedge end_date < '2019-12-01 \ 00:00:00'}(Statements) \\ R &\leftarrow \Pi_{cell_pn} S \\ COUNT(zip, payment_count) &\leftarrow_{zip} F_{count(cell_pn)} R \\ RSLT &\leftarrow_{zip} F_{avg(payment_count)} \end{aligned}$$

- (c) Arity = 2, Min = 0, Max = 25 (every customer could have 2 cell_pns, so that would mean 50/2, or 25 maximum cell_pns)

$$\begin{aligned} S(SSN, cell_pn_count) &\leftarrow_{SSN} F_{count(cell_pn)} \\ R &\leftarrow \sigma_{cell_pn_count > 1} S \\ RSLT &\leftarrow \Pi_{fname, lname}(R * Customers) \end{aligned}$$

- (d) Assumption: If there is only one Customer with a last name, we consider no one else in their family to be a customer of P_Mobile

Assumption: The count function does not count duplicates. For example, if there are two SSNs that are the same, $COUNT(SSN)$ would return 1.

$$\begin{aligned} \text{Arity} &= 1, \text{Min} = 0, \text{Max} = 50 \\ C(lname, count_ssn) &\leftarrow_{lname} F_{count(SSN)} Customers \\ RSLT &\leftarrow \Pi_{lname} (\sigma_{count_ssn=1} C) \end{aligned}$$

- (e) Arity = 1, Min = 0, Max = 1

This question is very vague, so I will assume that it is asking to find the sum of the charges for this customer.

$$\begin{aligned} C &\leftarrow \sigma_{cell_pn=4129876543 \wedge start_date \geq '1-01-2019'}(Statements) \\ RSLT &\leftarrow F_{sum(amount_due)} C \end{aligned}$$

2. See next page

Table 1: R

A	B	C	D
0	0	0	1
0	0	0	2
0	0	0	3
0	0	0	4
0	0	0	5
0	0	0	8
0	0	0	9
0	0	0	10
0	0	0	11
0	0	0	12
0	0	0	13
0	0	0	14
0	0	0	15

Table 2: S

D	E	F
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0

Table 3: R right-outer-join(R.D = S.D) S

R.A	R.B	R.C	R.D	S.D	S.E	S.F
0	0	0	1	1	0	0
0	0	0	2	2	0	0
0	0	0	3	3	0	0
0	0	0	4	4	0	0
0	0	0	5	5	0	0
0	0	0	8	null	null	null
0	0	0	9	null	null	null
0	0	0	10	null	null	null
0	0	0	11	null	null	null
0	0	0	12	null	null	null
0	0	0	13	null	null	null
0	0	0	14	null	null	null
0	0	0	15	null	null	null
null	null	null	null	6	0	0
null	null	null	null	7	0	0