Assigment 5

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	Operation	Name	Min. Result Size	Min. When...	Max. Result Size	Max. When...
1	$\sigma_\theta(R)$	Selection	0	no tuple matches θ	m	all tuple matches θ
2	$\pi_{A_1....A_k}$ R	Projection	0	there is no attribute	m	all attribute matches
3	$\rho_{x \leftarrow A} R$	Rename	m	-	m	-
4	$R \times A$	Cross Product	m * n	-	m*n	Both tables have tuples
5	$R \cap S$	Intersection	0	R and S are disjoint	min{m,n}	R and S are matching
6	$R \cup S$	Union	max{m,n}		0	R and S are disjoint
7	R \S	Difference\Minus	0		m	R and S are disjoint
8	$R \bowtie_\theta S$	Theta Join	0		m*n	
9	$R \bowtie S$	Natural Join	0	Tuples have same attributes but have no equals values	min{m, n}	have different attributes
10	R d—><— S	Left Outer Join	m	tuples from R which do not match to any tuples from S	m	Every tuple in S has a join partner in R
11	R d—><—d S	Full Outer Join	max{m,n}	each tuple of the bigger table has at most one join partner, all those of the smaller table at least one	m+n	all pairs of tuples match
12	R $\ltimes S$	Left semijoin	0		min{m,n}	
13	R $\bar{\ltimes}$ (R$\triangleright S$)	Left antijoin	0		m	

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(a)   I. Natural language: Find the names of all sets that have more than 2,000 parts.

   II. Relational algebra: $\pi_{sets.name}(\sigma_{sets.num\_parts>2000}\ sets)$

   III. SQL : SELECT name
       FROM sets
       WHERE num _ parts > 2000

(b)   I. Natural language: Find the names of all sets, that have a theme 'Star Wars'

   II. Relational algebra: $\pi_{sets.name}((\sigma_{name\ LIKE\ '\%StarWars\%'}\ themes) \bowtie_{themes.id=sets.theme_id} (\sigma_{year=2017}\ sets)$

   III. SQL : SELECT s.name
       FROM themes t
       JOIN sets s on s.theme_id = t.id
       WHERE t.name LIKE '% Star Wars %'

(c)   I. Natural language: Find parts number of parts, that have 'Zoo' in name and also are in categorie 'Plants and Animals'

   II. Relational algebra: $(\pi_{parts.part\_num}(\sigma_{parts.name\ LIKE\ '\%Zoo\%'})) \cup (\pi_{part\_num}(\rho_p(parts) \bowtie_{pc.id=p.part\_cat\_id}$ $(\sigma_{pc.name='PlantsandAnimals'}\ \rho_{pc}(part\_categories))))$

   III. SQL : SELECT part_num
       FROM parts

WHERE name LIKE '%Zoo%'
UNION
SELECT part_num
FROM parts p
JOIN part_categories pc ON pc.id = p.part_cat_id
WHERE pc.name = 'Plants and Animals ';

(d)   I. Natural language: Find the names of all sets released in 1976 that do not belong to a Construction theme.

II. Relational algebra: $\pi_{s.name}(\rho_s(sets)) \bowtie_{s.theme\_id=t.theme\_id} (\sigma_{s.year=1976\ AND\ t.name!='Construction'}(\rho_t(themes)))$

III. SQL : SELECT s.name
FROM sets s
JOIN themes t on t.id = s.theme_id
WHERE s.year = 1976 and t.name != 'Construction'

(e)   I. Natural language: Find the most number of parts in set that released in 2007

II. Relational algebra: $\pi_{s.num\_parts}(\sigma_{s.year=2007\ AND\ \rhd(\sigma_{sets.year=2007\ AND\ num\_parts\ s.numparts})}(\rho_s(sets)))$

III. SQL : SELECT s . num_parts
FROM sets s
WHERE s. year = 2007
AND NOT EXISTS (SELECT *
FROM sets
WHERE year = 2007
AND num_parts   s . num_parts) ;

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