

UNIVERSIDAD NACIONAL
AUTÓNOMA DE MÉXICO

FUNDAMENTOS DE BASES DE
DATOS

Tarea 4: Álgebra Relacional

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Ejercicio 1

- a) Toda la información de los usuarios que tienen una página, pero no incluyen blog.

$$r = \pi_{\text{user}, \text{pagina}, \text{titulo_blog}} (\text{Usuario} \bowtie \text{Página} \bowtie \text{Blog})$$

$$p = \text{user} \gamma_{\text{count}(\text{pagina}) \rightarrow \text{num_p}} (r)$$

$$b = \text{user} \gamma_{\text{count}(\text{titulo_blog}) \rightarrow \text{num_b}} (r)$$

$$Q = p \bowtie b$$

$$t = \pi_{\text{user}} (\sigma_{\text{num_b} = 0 \wedge \text{num_p} > 0} (Q))$$

$$\pi_{\text{user}} * (\text{User} \bowtie t)$$

b)

c)

- d) Un reporte que muestre por usuario y por álbum (galería) el total de fotos que haya subido al sitio.

$$r = \pi_{\text{user}, \text{titulo_galería}, \text{id_fotografía}} (\text{Usuario} \bowtie \text{Galería} \bowtie \text{Fotografía})$$

$$s = \text{usuario}, \gamma_{\text{count}(\text{id_fotografía}) \rightarrow \text{num_fotos}} (\text{Fotografía})$$

$$\pi_{\text{user}, \text{titulo_galería}, s} (\text{Usuario} \bowtie \text{Galería})$$

e)

Ejercicio 2

a)

- b) ¿Qué fabricantes producen computadoras portátiles con un disco duro de menos 100 GB?

The screenshot shows a web-based relational algebra calculator interface. On the left, there is a 'Database System' dropdown menu with a list of tables: Product, PC, Laptop, and Printer, each with its attributes. The main area displays a query in relational algebra: $\pi_{\text{maker}} (\sigma_{\text{hd} < 100} (\text{Product} \bowtie \text{Laptop}))$. Below the query, there is a visual query builder showing a tree structure: π_{maker} is the root, followed by $\sigma_{\text{hd} < 100}$, which is joined (\bowtie) with the join of Product and Laptop. At the bottom, the SQL equivalent query is shown: $\pi_{\text{maker}} (\sigma_{\text{hd} < 100} (\text{Product} \bowtie \text{Laptop}))$. The interface also includes buttons for 'ejecutar consulta', 'descargar', and 'historia'.

- c) Encontrar el número de modelo y el precio de todos los productos (de cualquier tipo) fabricados por el fabricante B.

$r = \sigma \text{ fabricante} = 'B'$ (Producto)

$s = \pi \text{ modelo, precio (Laptop)} \cup \pi \text{ modelo, precio (PC)} \cup \pi \text{ modelo, precio (Impresora)}$

$\pi \text{ modelo, precio (s} \bowtie r \text{)}$

Printer
model number
color boolean
type string
price number

$\pi \text{ modelo, precio}$

\bowtie

$\sigma \text{ maker = 'B'}$

\cup

$\pi \text{ modelo, precio}$

$\pi \text{ modelo, precio}$

Laptop

PC

Printer

Product

$\pi \text{ modelo, precio ((} \pi \text{ modelo, precio (Laptop)} \cup \pi \text{ modelo, precio (PC)} \cup \pi \text{ modelo, precio (Printer))} \bowtie (\sigma \text{ maker = 'B' (Product))))$

Laptop.model	Laptop.price
2007	1429
1004	649
1005	630
1006	1049

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- d)

- e) Encontrar los números de modelo de todas las impresoras láser a color.

relational algebra calculator - Mozilla Firefox

RelaxX - relational algebra calculator 0.19.1

Database System: Product

Printer

$\pi \text{ modelo}$

$\sigma \text{ color = true}$

Printer

$\pi \text{ modelo (} \sigma \text{ color = true (Printer))}$

Printer.model
3001
3003
3004
3006
3007

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f) Encontrar toda la información de los fabricantes que venden laptops pero no PCs.

$r = \pi_{\text{modelo, fabricante}}(\text{Producto})$

$s = \pi_{\text{fabricante}}(\pi_{\text{modelo}}(\text{Laptop}) \bowtie r)$

$t = \pi_{\text{fabricante}}(\pi_{\text{modelo}}(\text{PC}) \bowtie r)$

$s - t$

model number
speed number
ram number
hd number
screen number
price number

Printer
model number
color boolean
type string
price number

execute query

download history

Product, maker

F

G

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g)

h) Encontrar toda la información de las PCs que tienen la misma velocidad y RAM.

Product
maker string
model number
type string

PC
model number
speed number
ram number
hd number
price number

Laptop
model number
speed number
ram number
hd number
screen number
price number

Printer
model number
color boolean
type string
price number

relational algebra calculator - Mozilla Firefox

https://dbis-uibk.github.io/relax/calc.htm#

execute query

descargar historia

PC, model, speed, ram, hd, price, PC-price

PC	model	speed	ram	hd	price	PC-price
1003	1.42	512	80	478		
1011	1.86	2048	160	959		
1009	2	1024	250	650		
1002	2.1	512	250	985		
1007	2.2	1024	200	510		
1008	2.2	2048	250	770		
1001	2.66	1024	250	2114		
1004	2.8	1024	250	649		
1012	2.8	1024	160	649		
1010	2.8	2048	300	770		
1013	3.06	512	80	529		
1005	3.2	512	250	630		
1006	3.2	1024	320	1049		

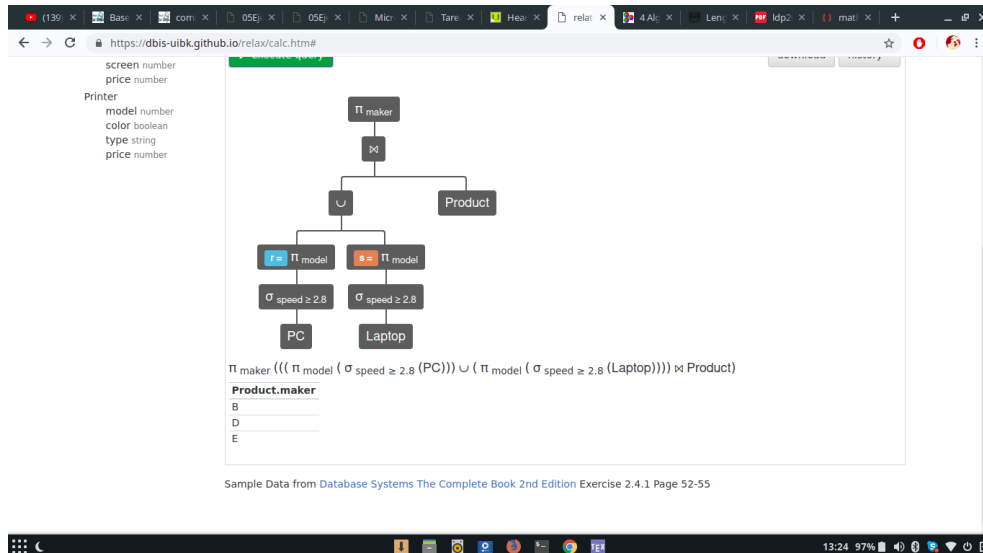
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- i) Encontrar aquellos fabricantes de mínimo dos computadoras diferentes (PC o laptops) con velocidades de al menos 2.80 GHz

$r = \pi \text{ modelo } (\sigma \text{ velocidad} \geq 2.8 \text{ (PC)})$

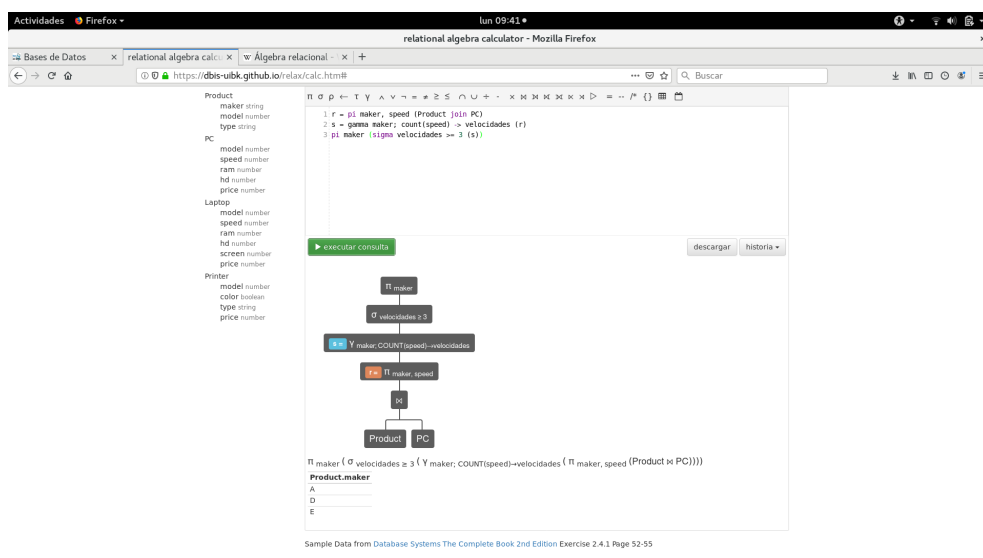
$s = \pi \text{ modelo } (\sigma \text{ velocidad} \geq 2.8 \text{ (Laptop)})$

$\pi \text{ fabricante } ((r \cup s) \bowtie \text{Producto})$



j)

- k) Encontrar los fabricantes de PC con al menos tres velocidades diferentes.



- l) Encontrar los fabricantes que venden exactamente tres modelos diferentes de PC.

$r = \pi_{\text{modelo, fabricante}}(\text{Producto} \bowtie \text{PC})$

$s = \gamma_{\text{fabricante}; \text{count}(\text{modelo}) \rightarrow \text{numproductos}}(r)$

$\pi_{\text{fabricante}}(\sigma_{\text{numproductos} = 3}(s))$

The screenshot shows a web-based relational algebra calculator. The query entered is:

$$\pi_{\text{maker}}(\sigma_{\text{num_products} = 3}(\gamma_{\text{maker}; \text{COUNT}(\text{modelo}) \rightarrow \text{num_products}}(\pi_{\text{model, maker}}(\text{Product} \bowtie \text{PC}))))$$

The interface includes a sidebar with a schema definition:

- screen: number
- price: number
- Printer:
 - model: number
 - color: boolean
 - type: string
 - price: number

Below the query, the result is displayed as a table:

Product.maker
A
B
D
E

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m)

- n) Crear un reporte que muestre por fabricante, el número de productos que tiene de cada tipo.

The screenshot shows the same relational algebra calculator with a different query:

$$\pi_{\text{maker, type, tipo}}(\gamma_{\text{maker, type}; \text{COUNT}(\text{modelo}) \rightarrow \text{tipo}}(\pi_{\text{maker, model, tipo}}(\text{Product})))$$

The result is displayed as a table:

Product.maker	Product.type	tipo
A	pc	3
A	laptop	3
B	pc	4
C	pc	1
D	pc	3
D	printer	2
E	pc	3
E	laptop	3
E	printer	3
F	laptop	2
G	laptop	1
H	printer	2

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ñ) Incrementar en un 15 % el tamaño del disco duro de las laptops del fabricante E que sean menores a 200 GB.

$r = \pi \text{ modelo } (\sigma \text{ fabricante} = 'E' \text{ (Producto)}) \bowtie \text{Laptop}$

$s = \sigma \text{ hd} < 200 (r)$

$t = \pi \text{ modelo, velocidad, ram, hd_nuevo} \leftarrow \text{hd} * 1.15, \text{ pantalla, precio } (s)$

t

The screenshot shows the Relax relational algebra calculator interface. The query being executed is:

$$\pi \text{ model, speed, ram, hd} * 1.15 \text{--new_hd, screen, price } (\sigma \text{ hd} < 200 (\pi \text{ model } (\sigma \text{ maker} = 'E' (\text{Product}) \bowtie \text{Laptop})))$$

The result table is as follows:

Product.model	Laptop.speed	Laptop.ram	new_hd	Laptop.screen	Laptop.price
2002	1.73	1024	92	17	949
2003	1.8	512	69	15.4	549

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o)

p) Borrar las impresoras de inyección de tinta.

The screenshot shows the Relax relational algebra calculator interface. The query being executed is:

$$\pi \text{ model, color, type, price } (\sigma \text{ type} = 'ink-jet' (\text{Printer}))$$

The result table is as follows:

Printer.model	Printer.color	Printer.type	Printer.price
3002	false	laser	239
3003	true	laser	899
3005	false	laser	120
3007	true	laser	200

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q)