

Tarea 4: Álgebra Relacional

Fundamentos de Bases de Datos

Hernández Ferreiro Enrique Ehecatl (315020904)

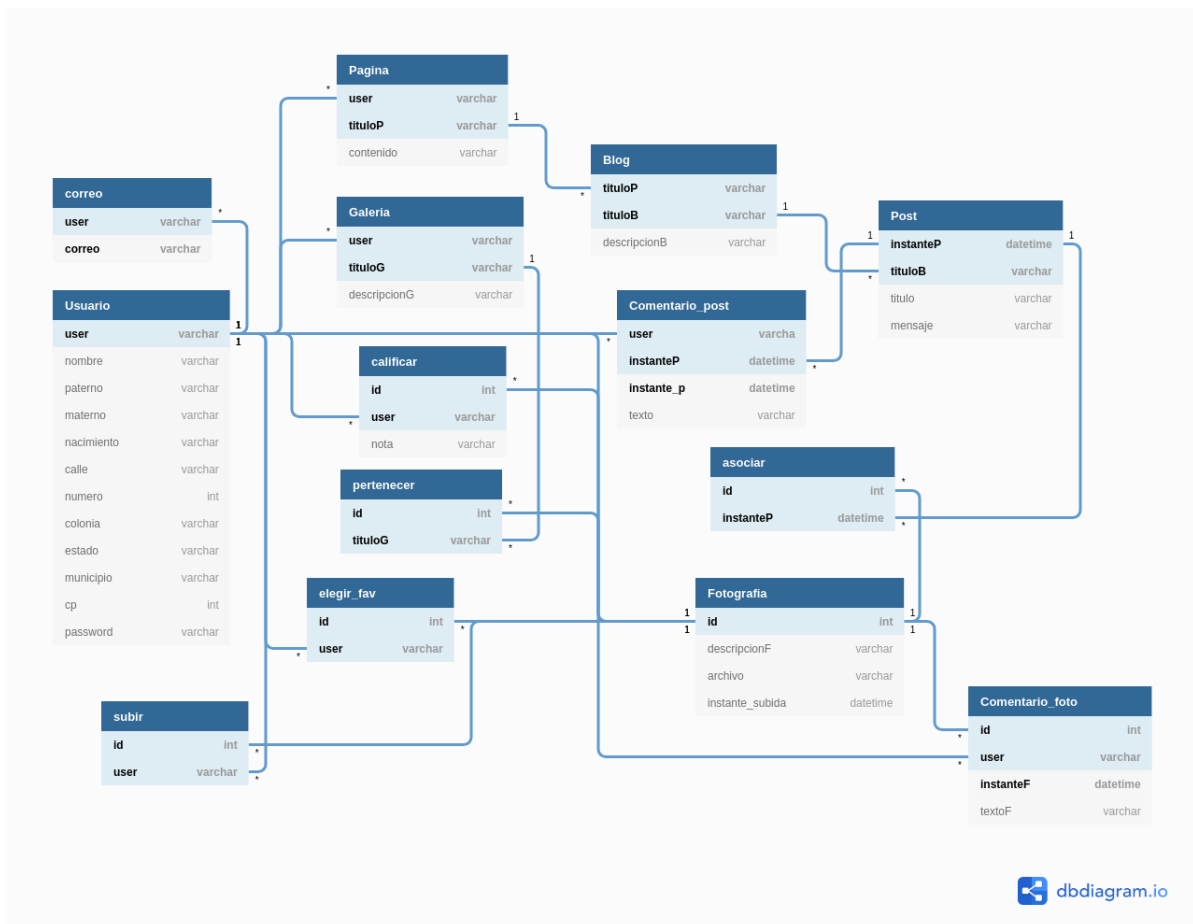
López Soto Ramses Antonio (315319974)

Miguel Torres Eric Giovanni (315230190)

Quintero Villeda Erik (315199345)

07 de octubre de 2019

1. Para el **problema 2** (tarea 3) que transformaste a **Modelo Relacional** escribe una expresión en **álgebra relacional** para cada una de las siguientes consultas:



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

$$Usuario \bowtie (Pagina - Blog)$$

- b. Una relación que muestre el número total de fotografías que se han subido por usuario.

$$\pi_{user, numFotos}((\gamma_{count(archivo) \rightarrow numFotos}(Fotografia)) \bowtie Usuario)$$

- c. El usuario que más comentarios ha realizado en fotos.

$$\pi_{user, numCom}((\gamma_{count(textoF) \rightarrow numCom}(Comentario_foto)) \bowtie Usuario)$$

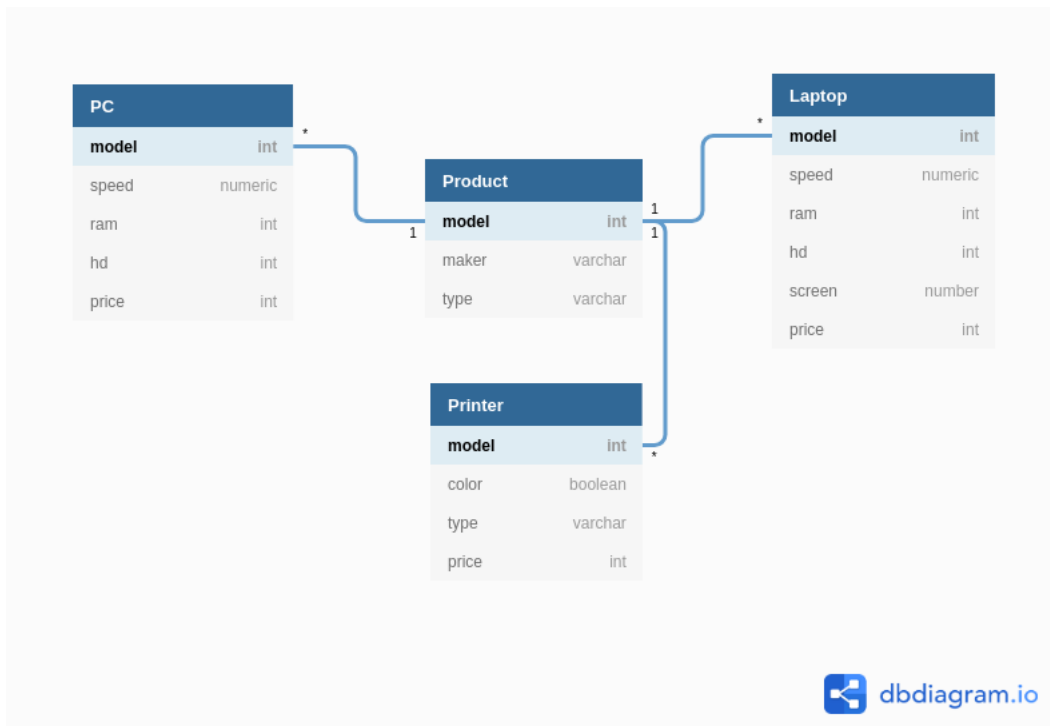
- d. Un reporte que muestre por usuario y por álbum (galería) el total de fotos que se han subido al sitio.

$$\pi_{user, tituloG, totalFotos}((\gamma_{count(archivo) \rightarrow totalFotos}(Fotografia)) \bowtie Usuario \bowtie Galeria)$$

- e. La fotografía con más "me gusta" por usuario.

$$\pi_{user, numLikes}((\gamma_{max(user) \rightarrow numLikes}(elegir_fav)) \bowtie Fotografia \bowtie Usuario)$$

2.- Si tienes el siguiente esquema para una Base de Datos:



Los fabricantes y los números de modelo se limpiaron, pero los datos son típicos de los productos a la venta a principios de 2007. Escribe **expresiones en álgebra relacional** para responder las siguientes consultas. Deberás comprobar cada una de ellas en **RelaX** y agregar en cada inciso una captura de pantalla con el resultado obtenido.

- a. ¿Qué modelos de PC tienen una velocidad entre 3 y 3.5 GHz?

$$\pi_{model}(\sigma_{speed \geq 3 \wedge speed \leq 3.5}(PC))$$

Database System... Algebra Relacional SQL Editor de Grupo

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

1 $\pi_{model}(\sigma_{speed \geq 3 \wedge speed \leq 3.5}(PC))$

▶ ejecutar consulta descargar historia

Diagrama de flujo de la consulta:

```

graph TD
    A[" $\pi_{model}$ "] --> B[" $\sigma_{speed \geq 3 \text{ and } speed \leq 3.5}$ "]
    B --> C["PC"]
  
```

$\pi_{model}(\sigma_{speed \geq 3 \text{ and } speed \leq 3.5}(PC))$

PC.model
1005
1006
1013

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

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

$$\pi_{maker}(Product \bowtie (\sigma_{hd < 100}(Laptop)))$$

Database System... Algebra Relacional SQL Editor de Grupo

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

1 $\pi_{maker}(Product \bowtie (\sigma_{hd < 100}(Laptop)))$

▶ ejecutar consulta descargar historia

Diagrama de flujo de la consulta:

```

graph TD
    A[" $\pi_{maker}$ "] --> B[" $\bowtie$ "]
    B --> C["Product"]
    B --> D[" $\sigma_{hd < 100}$ "]
    D --> E["Laptop"]
  
```

$\pi_{maker}(Product \bowtie (\sigma_{hd < 100}(Laptop)))$

Product.maker
A
E
F

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

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

$$(\pi_{model,price}(\sigma_{maker='B'}(Product \bowtie PC))) \cup (\pi_{model,price}(\sigma_{maker='B'}(Product \bowtie Laptop))) \cup (\pi_{Product.model,price}(\sigma_{maker='B'}(Product \bowtie_{Product.model=Printer.model} Printer)))$$

Database System... | **Algebra Relacional** | **SQL** | **Editor de Grupo**

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

ejecutar consulta | **descargar** | **historia**

Product.model PC.price

Product.model	PC.price
1004	649
1005	630
1006	1049
2007	1429

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

- d. Encontrar toda la información de los fabricantes que produzcan los tres tipos de productos.

$$\pi_{maker,Product.model,Product.type}(((\pi_{maker}(\sigma_{type='laptop'}(Product))) \cap (\pi_{maker}(\sigma_{type='pc'}(Product))) \cap (\pi_{maker}(\sigma_{type='printer'}(Product)))) \bowtie Product)$$

Database System... | **Algebra Relacional** | **SQL** | **Editor de Grupo**

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

ejecutar consulta | **descargar** | **historia**

Product.maker Product.model Product.type

Product.maker	Product.model	Product.type
E	1011	pc
E	1012	pc
E	1013	pc
E	2001	laptop
E	2002	laptop
E	2003	laptop
E	3001	printer
E	3002	printer
E	3003	printer

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

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

$$\pi_{model}(\sigma_{type='laser'} \wedge color=turquoise(Printer))$$

Database System...

Algebra Relacional **SQL** **Editor de Grupo**

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

Query Editor

SQL Query: $\pi_{model}(\sigma_{type = 'laser' \wedge color = true}(Printer))$

Visual Query Builder

```

graph TD
    A["Printer"] --> B["σ type = 'laser' and color = true"]
    B --> C["π model"]
  
```

Results

$\pi_{model}(\sigma_{type = 'laser' \wedge color = true}(Printer))$
Printer.model
3003
3007

- f.** Encontrar toda la información de los fabricantes que venden laptops pero no PC's.

$$\sigma_{type='laptop'}(((\pi_{maker}(\sigma_{type='laptop'}(Product)))) - (\pi_{maker}(\sigma_{type='laptop'}(Product)))) \bowtie Product \bowtie Laptop$$

Database System...

Algebra Relacional

SQL

Editor de Grupo

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

1 $\sigma_{type = 'laptop'} (((\pi_{maker} (\sigma_{type = 'laptop'} (Product))) - (\pi_{maker} (\sigma_{type = 'pc'} (Product)))) \bowtie Product \bowtie Laptop)$

▶ ejecutar consulta
descargar historia

$\sigma_{type = 'laptop'} (((\pi_{maker} (\sigma_{type = 'laptop'} (Product))) - (\pi_{maker} (\sigma_{type = 'pc'} (Product)))) \bowtie Product \bowtie Laptop)$

Product.maker	Product.model	Product.type	Laptop.speed	Laptop.ram	Laptop.hd	Laptop.screen	Laptop.price
F	2008	laptop	1.6	1024	100	15.4	900
F	2009	laptop	1.6	512	80	14.1	680
G	2010	laptop	2	2048	160	15.4	2300

Sample Data from [Database Systems The Complete Book 2nd Edition](#) Exercise 2.4.1 Page 52-55

g. Encontrar los tamaños de disco duro que están presentes en dos o más PC's.

$$\pi_{hd}(\sigma_{numHD > 1}(\gamma_{hd; count(hd) \rightarrow numHD}(PC)))$$

Database System... Algebra Relacional SQL Editor de Grupo

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

1 $\pi_{hd}(\sigma_{numHD > 1}(\gamma_{hd; count(hd) \rightarrow numHD}(PC)))$

ejecutar consulta descargar historia

Query Tree:

```

graph TD
    A["πhd"] --> B["σnumHD > 1"]
    B --> C["γhd, COUNT(hd) → numHD"]
    C --> D["PC"]
  
```

$\pi_{hd}(\sigma_{numHD > 1}(\gamma_{hd; COUNT(hd) \rightarrow numHD}(PC)))$

PC.hd
250
80
160

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

h. Encontrar toda la información de las PC's que tienen la misma velocidad y RAM.

$$PC \bowtie ((\pi_{speed, ram}(\sigma_{numRAM > 1}(\gamma_{speed, ram; count(ram) \rightarrow numRAM}(PC)))) \cup (\pi_{speed, ram}(\sigma_{numSpeed > 1}(\gamma_{speed, ram; count(speed) \rightarrow numSpeed}(PC)))))$$

Database System... Algebra Relacional SQL Editor de Grupo

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

1 $PC \bowtie ((\pi_{speed, ram}(\sigma_{numRAM > 1}(\gamma_{speed, ram; count(ram) \rightarrow numRAM}(PC)))) \cup (\pi_{speed, ram}(\sigma_{numSpeed > 1}(\gamma_{speed, ram; count(speed) \rightarrow numSpeed}(PC)))))$

2

ejecutar consulta descargar historia

Query Tree:

```

graph TD
    A["⋈"] --> B["PC"]
    A --> C["∪"]
    C --> D["πspeed, ram"]
    C --> E["πspeed, ram"]
    D --> F["σnumRAM > 1"]
    F --> G["γspeed, ram, COUNT(ram) → numRAM"]
    G --> H["PC"]
    E --> I["σnumSpeed > 1"]
    I --> J["γspeed, ram, COUNT(speed) → numSpeed"]
    J --> K["PC"]
  
```

$PC \bowtie ((\pi_{speed, ram}(\sigma_{numRAM > 1}(\gamma_{speed, ram; COUNT(ram) \rightarrow numRAM}(PC)))) \cup (\pi_{speed, ram}(\sigma_{numSpeed > 1}(\gamma_{speed, ram; COUNT(speed) \rightarrow numSpeed}(PC)))))$

PC.model	PC.speed	PC.ram	PC.hd	PC.price
1004	2.8	1024	250	649
1012	2.8	1024	160	649

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

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

$$(\pi_{maker}(\sigma_{speed \geq 2.8}(Product \bowtie Laptop))) \cup (\pi_{maker}(\sigma_{speed \geq 2.8}(Product \bowtie PC)))$$

The screenshot shows a database query editor with the following components:

- Database System:** A dropdown menu.
- Algebra Relacional / SQL:** Tabs for switching between relational algebra and SQL.
- Editor de Grupo:** A text area for writing the query.
- Query:**

```
1 (π maker (σ speed ≥ 2.8 (Product ⋈ Laptop))) ∪ (π maker (σ speed ≥ 2.8 (Product ⋈ PC)))
```
- Buttons:** "ejecutar consulta", "descargar", and "historia".
- Relational Algebra Diagram:** A tree diagram showing the execution plan. It starts with a union (∪) of two join (⋈) operations. Each join operation involves a selection (σ) on the speed attribute (speed ≥ 2.8) followed by a join (⋈) of the Product and Laptop/PC tables. The result is then projected (π) on the maker attribute.
- Result:** A table with the header "Product.maker" and rows B, D, and E.

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

- j. Encontrar el fabricante de la computadora (PC o laptop) con la velocidad más alta posible.

$$(\pi_{maker}(Product \bowtie (Laptop \bowtie_{speed = maxSL} (\gamma_{max(speed) \rightarrow maxSL}(Laptop))))) \cup (\pi_{maker}(Product \bowtie (PC \bowtie_{speed = maxSP} (\gamma_{max(speed) \rightarrow maxSP}(PC)))))$$

The screenshot shows a database query editor with the following components:

- Database System:** A dropdown menu.
- Algebra Relacional / SQL:** Tabs for switching between relational algebra and SQL.
- Editor de Grupo:** A text area for writing the query.
- Query:**

```
1 (π maker (Product ⋈ (Laptop ⋈ speed = maxSL (γ max(speed) → maxSL (Laptop))))) ∪ (π maker (Product ⋈ (PC ⋈ speed = maxSP (γ max(speed) → maxSP (PC)))))
```
- Buttons:** "ejecutar consulta", "descargar", and "historia".
- Relational Algebra Diagram:** A tree diagram showing the execution plan. It starts with a union (∪) of two join (⋈) operations. Each join operation involves a join (⋈) of the Product table with a join (⋈) of the Laptop/PC table and a selection (σ) on the speed attribute (speed = maxSL/maxSP). The selection is derived from a projection (γ) of the max(speed) attribute. The result is then projected (π) on the maker attribute.
- Result:** A table with the header "Product.maker" and rows A and B.

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

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

$$(\pi_{maker}(\sigma_{numS \geq 3}(\gamma_{maker; count(speed) \rightarrow numS}(PC \bowtie Product)))) - (\pi_{maker}(\sigma_{maker = 'B'}(PC \bowtie Product)))$$

Database System... Algebra Relacional SQL Editor de Grupo

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

1. $\pi_{maker}(\sigma_{numS \geq 3}(\gamma_{maker; count(speed) \rightarrow numS}(PC \bowtie Product))) - (\pi_{maker}(\sigma_{maker = 'B'}(PC \bowtie Product)))$

▶ ejecutar consulta descargar historia

Execution Plan Diagram:

```

graph TD
    Root["-"] --> P1["\pi maker"]
    Root --> P2["\pi maker"]
    P1 --> S1["\sigma numS \ge 3"]
    S1 --> G1["\gamma maker; COUNT(speed) \to numS"]
    G1 --> J1["\bowtie"]
    J1 --> PC1["PC"]
    J1 --> Product1["Product"]
    P2 --> S2["\sigma maker = 'B'"]
    S2 --> J2["\bowtie"]
    J2 --> PC2["PC"]
    J2 --> Product2["Product"]
  
```

$(\pi_{maker}(\sigma_{numS \geq 3}(\gamma_{maker; COUNT(speed) \rightarrow numS}(PC \bowtie Product)))) - (\pi_{maker}(\sigma_{maker = 'B'}(PC \bowtie Product)))$

Product.maker
A
D
E

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

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

$$\begin{aligned} & \pi_{maker}(((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'A'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie \\ & (\sigma_{maker = 'A'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'B'}(\pi_{maker, model}(Product \bowtie \\ & PC)))) \bowtie (\sigma_{maker = 'B'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'C'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie \\ & (\sigma_{maker = 'C'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'D'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie \\ & (\sigma_{maker = 'D'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'E'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie \\ & (\sigma_{maker = 'E'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'G'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie \\ & (\sigma_{maker = 'G'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'H'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie \\ & (\sigma_{maker = 'H'}(Product \bowtie PC)))) \end{aligned}$$

$\pi_{maker}(((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'A'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie (\sigma_{maker = 'A'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'B'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie (\sigma_{maker = 'B'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'C'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie (\sigma_{maker = 'C'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'D'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie (\sigma_{maker = 'D'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'E'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie (\sigma_{maker = 'E'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'G'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie (\sigma_{maker = 'G'}(Product \bowtie PC))) \cup ((\gamma_{count(model) \rightarrow numMod}(\sigma_{maker = 'H'}(\pi_{maker, model}(Product \bowtie PC)))) \bowtie (\sigma_{maker = 'H'}(Product \bowtie PC))))$

Product.maker
A
B
D
E

m. Encontrar toda la información de la laptop más cara.

$$Laptop \bowtie_{price=maxPrice} (\gamma_{max(price) \rightarrow maxPrice}(Laptop))$$

The screenshot shows a database query interface. On the left, there is a schema for a database system with tables: Product, PC, Laptop, and Printer. Each table has its attributes listed. The main area shows a query in SQL: `1 Laptop ⋈ price = maxPrice (γ max(price) → maxPrice (Laptop))`. Below the query, there is a visual query plan showing a join between 'Laptop' and a subquery 'Y: MAX(price) → maxPrice (Laptop)'. At the bottom, the results table is displayed with columns: Laptop.model, Laptop.speed, Laptop.ram, Laptop.hd, Laptop.screen, Laptop.price, and maxPrice. The results show a single row with values: 2001, 2, 2048, 240, 20.1, 3673, 3673.

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

$$\begin{aligned}
 & (\pi_{maker,numPC,numLaptop,numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='A' \wedge type='pc'}(Product)))) \bowtie \\
 & (\sigma_{maker='A'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='A' \wedge type='laptop'}(Product))) \bowtie \\
 & (\sigma_{maker='A'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='A' \wedge type='printer'}(Product))) \bowtie \\
 & (\sigma_{maker='A'}(Product)))) \cup \\
 & (\pi_{maker,numPC,numLaptop,numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='B' \wedge type='pc'}(Product)))) \bowtie \\
 & (\sigma_{maker='B'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='B' \wedge type='laptop'}(Product))) \bowtie \\
 & (\sigma_{maker='B'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='B' \wedge type='printer'}(Product))) \bowtie \\
 & (\sigma_{maker='B'}(Product)))) \cup \\
 & (\pi_{maker,numPC,numLaptop,numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='C' \wedge type='pc'}(Product)))) \bowtie \\
 & (\sigma_{maker='C'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='C' \wedge type='laptop'}(Product))) \bowtie \\
 & (\sigma_{maker='C'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='C' \wedge type='printer'}(Product))) \bowtie \\
 & (\sigma_{maker='C'}(Product)))) \cup \\
 & (\pi_{maker,numPC,numLaptop,numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='D' \wedge type='pc'}(Product)))) \bowtie \\
 & (\sigma_{maker='D'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='D' \wedge type='laptop'}(Product))) \bowtie \\
 & (\sigma_{maker='D'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='D' \wedge type='printer'}(Product))) \bowtie \\
 & (\sigma_{maker='D'}(Product)))) \cup \\
 & (\pi_{maker,numPC,numLaptop,numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='E' \wedge type='pc'}(Product)))) \bowtie \\
 & (\sigma_{maker='E'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='E' \wedge type='laptop'}(Product))) \bowtie \\
 & (\sigma_{maker='E'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='E' \wedge type='printer'}(Product))) \bowtie \\
 & (\sigma_{maker='E'}(Product)))) \cup \\
 & (\pi_{maker,numPC,numLaptop,numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='F' \wedge type='pc'}(Product)))) \bowtie \\
 & (\sigma_{maker='F'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='F' \wedge type='laptop'}(Product))) \bowtie \\
 & (\sigma_{maker='F'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='F' \wedge type='printer'}(Product))) \bowtie \\
 & (\sigma_{maker='F'}(Product)))) \cup \\
 & (\pi_{maker,numPC,numLaptop,numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='G' \wedge type='pc'}(Product)))) \bowtie
 \end{aligned}$$

$$\begin{aligned}
& (\sigma_{maker='G'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='G' \wedge type='laptop'}(Product))) \bowtie \\
& (\sigma_{maker='G'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='G' \wedge type='printer'}(Product))) \bowtie \\
& (\sigma_{maker='G'}(Product)))) \cup \\
& (\pi_{maker, numPC, numLaptop, numPrinter}(((\gamma_{count(type) \rightarrow numPC}(\sigma_{maker='H' \wedge type='pc'}(Product))) \bowtie \\
& (\sigma_{maker='H'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numLaptop}(\sigma_{maker='H' \wedge type='laptop'}(Product))) \bowtie \\
& (\sigma_{maker='H'}(Product))) \bowtie ((\gamma_{count(type) \rightarrow numPrinter}(\sigma_{maker='H' \wedge type='printer'}(Product))) \bowtie \\
& (\sigma_{maker='H'}(Product))))))
\end{aligned}$$

- o. Incrementar en un 15% el tamaño de disco duro de las laptops del fabricante E que son menores a 200 GB.

Database System...

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

Algebra Relacional
SQL
Editor de Historial

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

1 π maker, model, ram, nuevoTamHD <- hd*1.15, price (σ maker = 'E' \wedge hd < 200 (Product \bowtie Laptop)))

▶ ejecutar consulta
descargar
historia

```

graph TD
    A[" $\pi$  maker, model, ram, hd * 1.15 --nuevoTamHD, price"]
    B[" $\sigma$  maker = 'E' and hd < 200"]
    C[" $\bowtie$ "]
    D["Product"]
    E["Laptop"]
    A --- B
    B --- C
    C --- D
    C --- E
        
```

π maker, model, ram, hd * 1.15--nuevoTamHD, price (σ maker = 'E' and hd < 200 (Product \bowtie Laptop)))

Product.maker	Product.model	Laptop.ram	nuevoTamHD	Laptop.price
E	2002	1024	92	949
E	2003	512	69	549

p. Borrar todas las impresoras de inyección de tinta.

$$(\pi_{model,color,type,price}(Printer)) - (\sigma_{type='ink-jet'}(Printer))$$

Database System... Algebra Relacional SQL Editor de Grupo

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

1. (pi model, color, type, price (Printer)) - (sigma type = 'ink-jet' (Printer))

ejecutar consulta descargar historia

Printer

(pi model, color, type, price (Printer)) - (sigma type = 'ink-jet' (Printer))

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

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

q. Insertar un nuevo fabricante que produzca los tres tipos de productos e insertar al menos un producto de cada tipo para este fabricante.

$product = \{ maker : string \quad model : number \quad type : string$

$I \quad 2004 \quad laptop$

$I \quad 1014 \quad pc$

$I \quad 3008 \quad printer$

$\}$

$pc = \{ model : number \quad speed : number \quad ram : number \quad hd : number \quad price : number$

$2004 \quad 1.80 \quad 300 \quad 250 \quad 1235$

$\}$

$laptop = \{ model : number \quad speed : number \quad ram : number \quad hd : number \quad screen : number \quad price : number$

$1014 \quad 2.60 \quad 450 \quad 500 \quad 25.2 \quad 2067$

$\}$

$printer = \{ model : number \quad color : boolean \quad type : string \quad price : number$

$3008 \quad true \quad laser \quad 2045$

$\}$

$Product \cup product$

Database System

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

Algebra Relacional **SQL** Editor de Grupo

```

1 product = { maker:string model:number type:string
2             I      2004      laptop
3             I      1014      pc
4             I      3008      printer
5 }
6
7 pc = { model:number speed:number ram:number hd:number price:number
8       2004      1.80      300      250      1235
9 }
10
11 laptop = { model:number speed:number ram:number hd:number screen:number price:number
12           1014      2.60      450      500      25.2      2067
13 }
14
15 printer = { model:number color:boolean type:string price:number
16            3008      true      laser      2045
17 }
18
19 Product ∪ product
          
```

[ejecutar consulta](#) [descargar](#) [historia](#)

Product ∪ (inlineRelation1)

	Product.maker	Product.model	Product.type
A	1001	pc	
A	1002	pc	
A	1003	pc	
A	2004	laptop	
A	2005	laptop	
A	2006	laptop	
B	1004	pc	
B	1005	pc	
B	1006	pc	
B	2007	pc	
C	1007	pc	
D	1008	pc	
D	1009	pc	
D	1010	pc	
D	3004	printer	
D	3005	printer	
E	1011	pc	
E	1012	pc	
E	1013	pc	
E	2001	laptop	
E	2002	laptop	
E	2003	laptop	
E	3001	printer	
E	3002	printer	
E	3003	printer	
F	2008	laptop	
F	2009	laptop	
G	2010	laptop	
H	3006	printer	
H	3007	printer	
I	1014	laptop	
I	1014	pc	
I	3008	printer	

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

$(Product \cup product) \bowtie (PC \cup pc)$

Database System

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

Algebra Relacional **SQL** Editor de Grupo

```

1 product = { maker:string model:number type:string
2             I      2004      laptop
3             I      1014      pc
4             I      3008      printer
5 }
6
7 pc = { model:number speed:number ram:number hd:number price:number
8       2004      1.80      300      250      1235
9 }
10
11 laptop = { model:number speed:number ram:number hd:number screen:number price:number
12           1014      2.60      450      500      25.2      2067
13 }
14
15 printer = { model:number color:boolean type:string price:number
16            3008      true      laser      2045
17 }
18
19 (Product ∪ product) ⋈ (PC ∪ pc)
          
```

[ejecutar consulta](#) [descargar](#) [historia](#)

(Product ∪ (inlineRelation1)) ⋈ (PC ∪ (inlineRelation2))

	Product.maker	Product.model	Product.type	PC.speed	PC.ram	PC.hd	PC.price
A	1001	pc		2.66	1024	250	2114
A	1002	pc		2.1	512	250	995
A	1003	pc		1.42	512	80	478
A	2004	laptop		1.8	300	250	1235
B	1004	pc		2.8	1024	250	649
B	1005	pc		3.2	512	250	630
B	1006	pc		3.2	1024	320	1049
C	1007	pc		2.2	1024	200	510
D	1008	pc		2.2	2048	250	770
D	1009	pc		2	1024	250	650
D	1010	pc		2.8	2048	300	770

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-55

Sample Data from Database Systems The Complete Book 2nd Edition Exercise 2.4.1 Page 52-53