Bases de datos 2023-1
Tarea 4: Álgebra Relacional

7 de noviembre de 2022

1. Cardinalidad de la consulta Considera las siguientes relaciones:

R

A	B
1	x
2	y
2	z
3	x
9	a

S

B	C	D
x	0	3
y	2	1
y	3	3
w	3	0
y	4	2

Para las siguientes expresiones de álgebra relacional completa la tabla con el número de tuplas. Deberás indicar las tablas resultantes en cada caso.

Expresión	Cardinalidad del resultado
$R \times S$	25
$R \bowtie_{\theta D>A} S$	7
$R =\!\bowtie S$	7
$R \bowtie\!= S$	6
$R \bowtie_{\theta A=D} S$	5
$\rho_{C \leftarrow A}(R) \bowtie S$	4
$\Pi_B(R) - \Pi_B(\sigma_{C \geq 3}(S))$	3
$\Pi_A(R) \cap \rho_{A \leftarrow D}(\Pi_D(S))$	3
$\Pi_D(S) \bowtie R$	20
$\gamma_{A;count(B) \rightarrow t}(R =\!\bowtie\!= S)$	5

tablas:

- $R \times S$

A	BR	BS	C	D
1	x	x	0	3
1	x	y	2	1
1	x	y	3	3
1	x	w	3	0
1	x	y	4	2
2	y	x	0	3
2	y	y	2	1
2	y	y	3	3
2	y	w	3	0
2	y	y	4	2
2	z	x	0	3
2	z	y	2	1
2	z	y	3	3
2	z	w	3	0
2	z	y	4	2
3	x	x	0	3
3	x	y	2	1
3	x	y	3	3
3	x	w	3	0
3	x	y	4	2
9	a	x	0	3
9	a	y	2	1
9	a	y	3	3
9	a	w	3	0
9	a	y	4	2

- $R \bowtie_{\theta D>A} S$

A	BR	BS	C	D
1	x	x	0	3
1	x	y	3	3
1	x	y	4	2
2	y	x	0	3
2	y	y	3	3
2	z	x	0	3
2	z	y	3	3

- $R =\bowtie S$

A	BR	BS	C	D
1	x	x	0	3
2	y	y	2	1
2	y	y	3	3
2	y	y	4	2
2	z	NULL	NULL	NULL
3	x	x	0	3
9	a	NULL	NULL	NULL

- $R \bowtie = S$

A	BR	BS	C	D
1	x	x	0	3
3	x	x	0	3
2	y	y	2	1
2	y	y	3	3
NULL	NULL	w	3	0
2	y	y	4	2

- $R \bowtie_{\theta A=D} S$

A	BR	BS	C	D
1	x	y	2	1
2	y	y	4	2
2	z	y	4	2
3	x	x	0	3
3	x	y	3	3

- $\rho_{C \leftarrow A}(R) \bowtie S$

C	RB	SB	D
2	y	y	1
2	z	y	1
3	x	y	3
3	x	w	0

- $\pi_B(R) - \pi_B(\sigma_{C \geq 3}(S))$

B
x
z
a

- $\Pi_A(R) \cap \rho_{A \leftarrow D}(\Pi_D(S))$

A
1
2
3

- $\Pi_D(S) \bowtie R$

D	A	B
3	1	x
1	1	x
0	1	x
2	1	x
3	2	y
1	2	y
0	2	y
2	2	y
3	2	z
1	2	z
0	2	z
2	2	z
3	3	x
1	3	x
0	3	x
2	3	x
3	9	a
1	9	a
0	9	a
2	9	a

- $\gamma_{A;count(B)\to t}(R =\bowtie= S)$

A	T
1	1
2	4
3	1
9	1
NULL	1

2. Tienda de productos en línea.

Operaciones de mantenimiento de datos

a. Borrar toda la información del cliente `Paul Stevenson`
Consulta: $Customer1 = Customer - \sigma_{CustomerName='PaulStevenson'}(Customer)$

customer - σ customername = 'Paul Stevenson' (customer)

customer.customerid	customer.customername	customer.segment	customer.country	customer.city	customer.state	customer.postalcode	c
CG-12520	Claire Gute	Consumer	United States	Henderson	Kentucky	42420	S
DV-13045	Darrin Van Huff	Corporate	United States	Los Angeles	California	90036	W
SO-20335	Sean ODonnell	Consumer	United States	Fort Lauderdale	Florida	33311	S
BH-11710	Brosina Hoffman	Consumer	United States	Los Angeles	California	90032	W
AA-10480	Andrew Allen	Consumer	United States	Concord	North Carolina	28027	S
IM-15070	Irene Maddox	Consumer	United States	Seattle	Washington	98103	W
HP-14815	Harold Pawlan	Home Office	United States	Fort Worth	Texas	76106	C
PK-19075	Pete Kriz	Consumer	United States	Madison	Wisconsin	53711	C
AG-10270	Alejandro Grove	Consumer	United States	West Jordan	Utah	84084	W
ZD-21925	Zuschuss Donatelli	Consumer	United States	San Francisco	California	94109	W
KB-16585	Ken Black	Corporate	United States	Fremont	Nebraska	68025	C
SF-20065	Sandra Flanagan	Consumer	United States	Philadelphia	Pennsylvania	19140	E
EB-13870	Emily Burns	Consumer	United States	Orem	Utah	84057	W
EH-13945	Eric Hoffmann	Consumer	United States	Los Angeles	California	90049	W
TB-21520	Tracy Blumstein	Consumer	United States	Philadelphia	Pennsylvania	19140	E
MA-17560	Matt Abelman	Home Office	United States	Houston	Texas	77095	C
GH-14485	Gene Hale	Corporate	United States	Richardson	Texas	75080	C
SN-20710	Steve Nguyen	Home Office	United States	Houston	Texas	77041	C
LC-16930	Linda Cazamias	Corporate	United States	Naperville	Illinois	60540	C
RA-19885	Ruben Ausman	Corporate	United States	Los Angeles	California	90049	W
ES-14080	Erin Smith	Corporate	United States	Melbourne	Florida	32935	S
ON-18715	Odella Nelson	Corporate	United States	Eagan	Minnesota	55122	C
PO-18865	Patrick ODonnell	Consumer	United States	Westland	Michigan	48185	C
LH-16900	Lena Hernandez	Consumer	United States	Dover	Delaware	19901	E
DP-13000	Darren Powers	Consumer	United States	New Albany	Indiana	47150	C

b. Borrar todas las ordenes de la ciudad de `Utah` que tengan artículos de la subcategoría `Tables`.
Consulta:
$A = \pi_{CustomerID}(\sigma_{State='Utah'}Customer)$
$B = \pi_{ProductID}(\sigma_{Subcategory='Tables'}Products)$
$Orders1 = Orders - (Orders \bowtie A \bowtie B)$

orders - orders ⋈ (π customerid (σ state = 'Utah' customer)) ⋈ (π productid (σ subcategory = 'Tables' products))

orders.orderid	orders.orderdate	orders.shipdate	orders.shipmode	orders.customerid	orders.productid	orders.quantity
CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	FUR-BO-10001798	2
CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	FUR-CH-10000454	3
CA-2016-138688	2016-06-12	2016-06-16	Second Class	DV-13045	OFF-LA-10000240	2
US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	FUR-TA-10000577	5
US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	OFF-ST-10000760	2
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	FUR-FU-10001487	7
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	OFF-AR-10002833	4
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	TEC-PH-10002275	6
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	OFF-BI-10003910	3
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	OFF-AP-10002892	5
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	FUR-TA-10001539	9
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	TEC-PH-10002033	4
CA-2017-114412	2017-04-15	2017-04-20	Standard Class	AA-10480	OFF-PA-10002365	3
CA-2016-161389	2016-12-05	2016-12-10	Standard Class	IM-15070	OFF-BI-10003656	3
US-2015-118983	2015-11-22	2015-11-26	Standard Class	HP-14815	OFF-AP-10002311	5
US-2015-118983	2015-11-22	2015-11-26	Standard Class	HP-14815	OFF-BI-10000756	3
CA-2014-105893	2014-11-11	2014-11-18	Standard Class	PK-19075	OFF-ST-10004186	6
CA-2014-167164	2014-05-13	2014-05-15	Second Class	AG-10270	OFF-ST-10000107	2
CA-2014-143336	2014-08-27	2014-09-01	Second Class	ZD-21925	OFF-AR-10003056	2
CA-2014-143336	2014-08-27	2014-09-01	Second Class	ZD-21925	TEC-PH-10001949	3
CA-2014-143336	2014-08-27	2014-09-01	Second Class	ZD-21925	OFF-BI-10002215	4
CA-2016-137330	2016-12-09	2016-12-13	Standard Class	KB-16585	OFF-AR-10000246	7
CA-2016-137330	2016-12-09	2016-12-13	Standard Class	KB-16585	OFF-AP-10001492	7
US-2017-156909	2017-07-16	2017-07-18	Second Class	SF-20065	FUR-CH-10002774	2
CA-2016-121755	2016-01-16	2016-01-20	Second Class	EH-13945	OFF-BI-10001634	2
CA-2016-121755	2016-01-16	2016-01-20	Second Class	EH-13945	TEC-AC-10003027	3

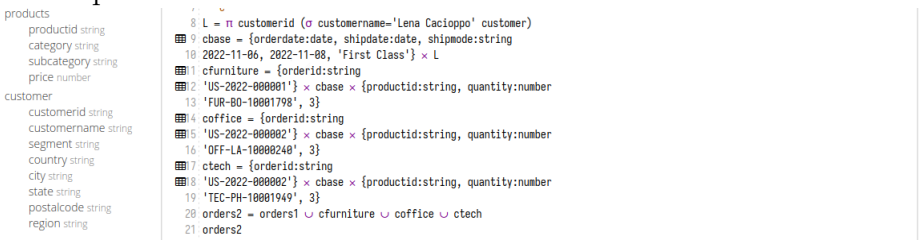
c. La clienta `Lena Cacioppo` compró un producto de cada subcategoría de `Furniture`. Deberás elegir los productos que desees e indicar como parte de esta consulta, la información que se agregará en cada caso.

Elegimos un producto de cada categoría al azar y obtuvimos su id. Luego construimos una relación en línea (juntándola con la id de la clienta) y la unimos a Orders.

Información agregada: (Orders)

OrderID	OrderDate	ShipDate	ShipMode	CustomerID	ProductID	Quantity
'US-2022-000001'	2022-11-06	2022-11-08	First Class	LC-16870	FUR-BO-10001798	3
'US-2022-000002'	2022-11-06	2022-11-08	First Class	LC-16870	OFF-LA-10000240	3
'US-2022-000003'	2022-11-06	2022-11-08	First Class	LC-16870	TEC-PH-10001949	3

La consulta quedo:



(orders - orders ⋈ (π customerid (σ state = 'Utah' customer)) ⋈ (π productid (σ subcategory = 'Tables' products))) ∪ (_inlineRelation2 × (_inlineRelation1 × (π customerid (σ customername = 'Lena Cacioppo' customer))) × _inlineRelation3) ∪ (_inlineRelation4 × (_inlineRelation1 × (π customerid (σ customername = 'Lena Cacioppo' customer))) × _inlineRelation5) ∪ (_inlineRelation6 × (_inlineRelation1 × (π customerid (σ customername = 'Lena Cacioppo' customer))) × _inlineRelation7)

orders.orderid	orders.orderdate	orders.shipdate	orders.shipmode	orders.customerid	orders.productid	orders.quantity
CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	FUR-BO-10001798	2
CA-2016-152156	2016-11-08	2016-11-11	Second Class	CG-12520	FUR-CH-10000454	3
CA-2016-138688	2016-06-12	2016-06-16	Second Class	DV-13045	OFF-LA-10000240	2
US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	FUR-TA-10000577	5
US-2015-108966	2015-10-11	2015-10-18	Standard Class	SO-20335	OFF-ST-10000760	2
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	FUR-FU-10001487	7
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	OFF-AR-10002833	4
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	TEC-PH-10002275	6
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	OFF-BI-10003910	3
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	OFF-AP-10002892	5
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	FUR-TA-10001539	9
CA-2014-115812	2014-06-09	2014-06-14	Standard Class	BH-11710	TEC-PH-10002033	4
CA-2017-114412	2017-04-15	2017-04-20	Standard Class	AA-10480	OFF-PA-10002365	3
CA-2016-161389	2016-12-05	2016-12-10	Standard Class	IM-15070	OFF-BI-10003656	3
US-2015-118983	2015-11-22	2015-11-26	Standard Class	HP-14815	OFF-AP-10002311	5
US-2015-118983	2015-11-22	2015-11-26	Standard Class	HP-14815	OFF-BI-10000756	3
CA-2014-105893	2014-11-11	2014-11-18	Standard Class	PK-19075	OFF-ST-10004186	6
CA-2014-167164	2014-05-13	2014-05-15	Second Class	AG-10270	OFF-ST-10000107	2
CA-2014-143336	2014-08-27	2014-09-01	Second Class	ZD-21925	OFF-AR-10003056	2
CA-2014-143336	2014-08-27	2014-09-01	Second Class	ZD-21925	TEC-PH-10001949	3

d. Aumentar los precios de productos de la subcategoría `Phones` en un `8 %`.
Consulta:

$A = \sigma_{Subcategory='Phones'}(Products)$

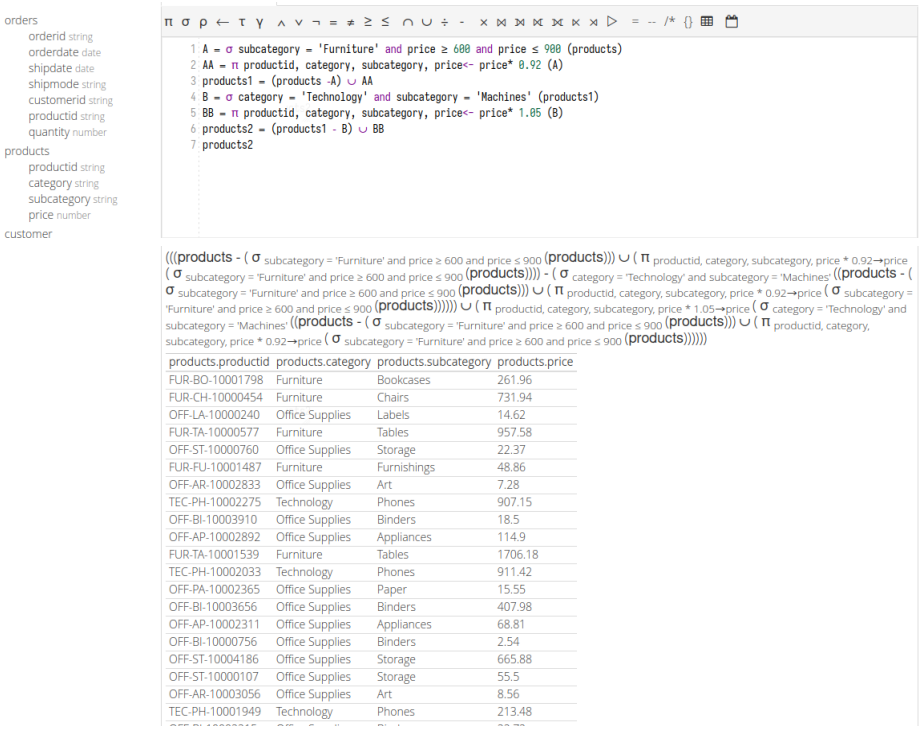
$U = \pi_{ProductID,Category,Subcategory,price \leftarrow price*1,08} A$

$Products = (Products - A) \cup U$

(products - (σ subcategory = 'Phones' (products))) ∪ (π productid, category, subcategory, price * 1.08→price (σ subcategory = 'Phones' (products)))

products.productid	products.category	products.subcategory	products.price
FUR-BO-10001798	Furniture	Bookcases	261.96
FUR-CH-10000454	Furniture	Chairs	731.94
OFF-LA-10000240	Office Supplies	Labels	14.62
FUR-TA-10000577	Furniture	Tables	957.58
OFF-ST-10000760	Office Supplies	Storage	22.37
FUR-FU-10001487	Furniture	Furnishings	48.86
OFF-AR-10002833	Office Supplies	Art	7.28
OFF-BI-10003910	Office Supplies	Binders	18.5
OFF-AP-10002892	Office Supplies	Appliances	114.9
FUR-TA-10001539	Furniture	Tables	1706.18
OFF-PA-10002365	Office Supplies	Paper	15.55
OFF-BI-10003656	Office Supplies	Binders	407.98
OFF-AP-10002311	Office Supplies	Appliances	68.81
OFF-BI-10000756	Office Supplies	Binders	2.54
OFF-ST-10004186	Office Supplies	Storage	665.88
OFF-ST-10000107	Office Supplies	Storage	55.5
OFF-AR-10003056	Office Supplies	Art	8.56
OFF-BI-10002215	Office Supplies	Binders	22.72
OFF-AR-10000246	Office Supplies	Art	19.46
OFF-AP-10001492	Office Supplies	Appliances	60.34
FUR-CH-10002774	Furniture	Chairs	71.37
OFF-BI-10001634	Office Supplies	Binders	1044.63
TEC-AC-10003027	Technology	Accessories	11.65

e. Disminuir `8%` los precios de los productos de la categoría `Furniture` cuyo precio sea de `$600` a `$900`. Aumentar en un `5%` los precios de los productos de la categoría Technology y subcategoría Machines.



(((products - (σ subcategory = 'Furniture' and price ≥ 600 and price ≤ 900 (products))) ∪ (π productid, category, subcategory, price * 0.92→price (σ subcategory = 'Furniture' and price ≥ 600 and price ≤ 900 (products)))) - (σ category = 'Technology' and subcategory = 'Machines' (((products - (σ subcategory = 'Furniture' and price ≥ 600 and price ≤ 900 (products))) ∪ (π productid, category, subcategory, price * 0.92→price (σ subcategory = 'Furniture' and price ≥ 600 and price ≤ 900 (products)))))) ∪ (π productid, category, subcategory, price * 1.05→price (σ category = 'Technology' and subcategory = 'Machines' (((products - (σ subcategory = 'Furniture' and price ≥ 600 and price ≤ 900 (products))) ∪ (π productid, category, subcategory, price * 0.92→price (σ subcategory = 'Furniture' and price ≥ 600 and price ≤ 900 (products))))))

products.productid	products.category	products.subcategory	products.price
FUR-BO-10001798	Furniture	Bookcases	261.96
FUR-CH-10000454	Furniture	Chairs	731.94
OFF-LA-10000240	Office Supplies	Labels	14.62
FUR-TA-10000577	Furniture	Tables	957.58
OFF-ST-10000760	Office Supplies	Storage	22.37
FUR-FU-10001487	Furniture	Furnishings	48.86
OFF-AR-10002833	Office Supplies	Art	7.28
TEC-PH-10002275	Technology	Phones	907.15
OFF-BI-10003910	Office Supplies	Binders	18.5
OFF-AP-10002892	Office Supplies	Appliances	114.9
FUR-TA-10001539	Furniture	Tables	1706.18
TEC-PH-10002033	Technology	Phones	911.42
OFF-PA-10002365	Office Supplies	Paper	15.55
OFF-BI-10003656	Office Supplies	Binders	407.98
OFF-AP-10002311	Office Supplies	Appliances	68.81
OFF-BI-10000756	Office Supplies	Binders	2.54
OFF-ST-10004186	Office Supplies	Storage	665.88
OFF-ST-10000107	Office Supplies	Storage	55.5
OFF-AR-10003056	Office Supplies	Art	8.56
TEC-PH-10001949	Technology	Phones	213.48