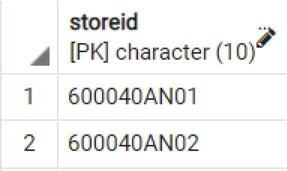
Q1. Retrieve the stores located in a particular location.

$\Pi_{\text{storeID}}(\sigma_{<\text{location='Anna nagar'}>}(\text{store}))$

```
SELECT storeID FROM store where located= 'Anna Nagar';
```

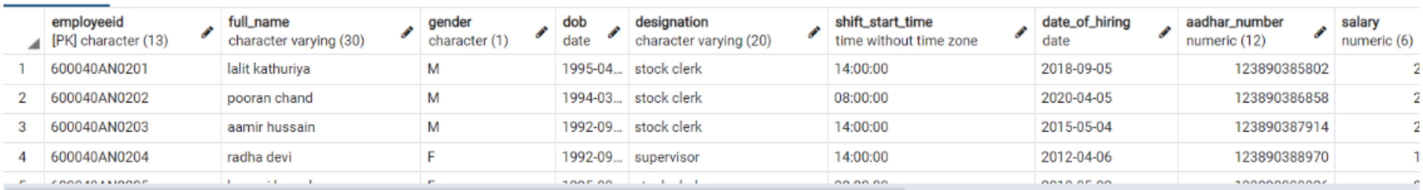


	storeid [PK] character (10)
1	600040AN01
2	600040AN02

Q2. Retrieve the details of employees working in a particular store.

$\Pi_{\text{fname}}(\sigma_{<\text{storeID='600040AN01'}>}(\text{employee}))$

```
SELECT * FROM employee where storeid='600040AN02';
```



	employeeid [PK] character (13)	full_name character varying (30)	gender character (1)	dob date	designation character varying (20)	shift_start_time time without time zone	date_of_hiring date	aadhar_number numeric (12)	salary numeric (6)
1	600040AN0201	lalit kathuriya	M	1995-04...	stock clerk	14:00:00	2018-09-05	123890385802	2
2	600040AN0202	pooran chand	M	1994-03...	stock clerk	08:00:00	2020-04-05	123890386858	2
3	600040AN0203	aamir hussain	M	1992-09...	stock clerk	14:00:00	2015-05-04	123890387914	2
4	600040AN0204	radha devi	F	1992-09...	supervisor	14:00:00	2012-04-06	123890388970	1

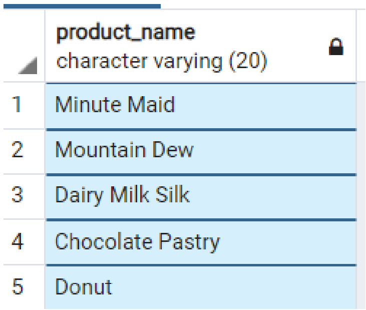
Q3. Retrieve the list of all the products less in stock or out of stock, under a particular category, from a particular store.

$r_1 \text{<-} \sigma_{<\text{categoryname='confectionaries and cool drinks'}>}(\text{category})$

$r_2 \text{<-} r1 \bowtie_{(\text{r1.categoryID=p.categoryID})} \rho(\text{product,p}) \bowtie_{(\text{p.productID=co.productID})} \rho(\text{contains,co})$

$\text{result} \text{<-} \sigma_{<\text{stock<=10 AND storeID='600040AN01'}>} r_2$

```
SELECT product_name FROM (
        SELECT * FROM contains as co JOIN products as p ON (p.productID=co.productID)
        JOIN (
                SELECT * FROM category as c
                WHERE category_name='confectionaries and cool drinks'
                ) as r1 ON (r1.categoryID=p.categoryID)
        ) as r2 where stock<=10 AND storeID='600040AN01';
```

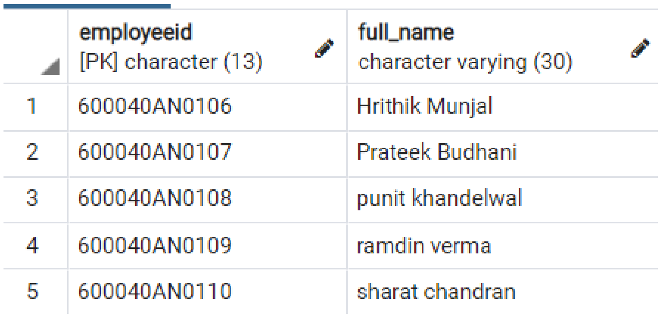


	product_name character varying (20)
1	Minute Maid
2	Mountain Dew
3	Dairy Milk Silk
4	Chocolate Pastry
5	Donut

Q4. List of employees who have not received their salary.

$\Pi_{\text{employeeID,fname}}(\sigma_{<\text{salary\_status='unpaid'}>}(\text{employee}))$

SELECT employeeID,full_name FROM employee WHERE salary_status='unpaid';

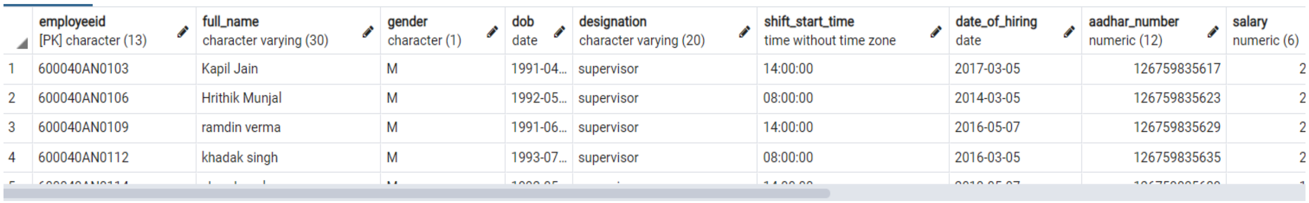


	employeeid [PK] character (13)	full_name character varying (30)
1	600040AN0106	Hrithik Munjal
2	600040AN0107	Prateek Budhani
3	600040AN0108	punit khandelwal
4	600040AN0109	ramdin verma
5	600040AN0110	sharat chandran

Q5. Retrieve the list of supervisors, and employees under each supervisor.

(I) $\sigma_{<\text{designation='Supervisor'}>}(\text{EMPLOYEE})$

```
SELECT * FROM EMPLOYEE
where designation='supervisor';
```

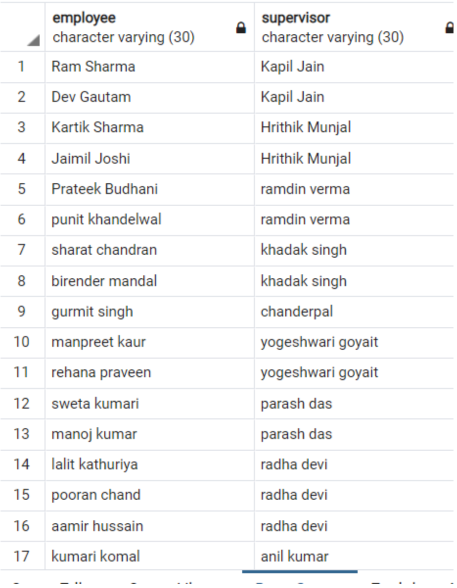


	employeeid [PK] character (13)	full_name character varying (30)	gender character (1)	dob date	designation character varying (20)	shift_start_time time without time zone	date_of_hiring date	aadhar_number numeric (12)	salary numeric (6)
1	600040AN0103	Kapil Jain	M	1991-04...	supervisor	14:00:00	2017-03-05	126759835617	2
2	600040AN0106	Hrithik Munjal	M	1992-05...	supervisor	08:00:00	2014-03-05	126759835623	2
3	600040AN0109	ramdin verma	M	1991-06...	supervisor	14:00:00	2016-05-07	126759835629	2
4	600040AN0112	khadak singh	M	1993-07...	supervisor	08:00:00	2016-03-05	126759835635	2
5	[illegible]	[illegible]	M	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1

(II) $r_1 \leftarrow \sigma_{<\text{designation='Supervisor'}>}(\text{EMPLOYEE})$

$\Pi_{<\text{e.full\_name,r1.full\_name}>}(\ \rho(\text{e,employee}) \bowtie_{<\text{e.supervisorID=r1.employeeID}>} (r_1))$

```
SELECT e.full_name as employee, r1.full_name as supervisor FROM (EMPLOYEE as e
JOIN(
        SELECT * FROM EMPLOYEE
        where designation='supervisor'
) as r1 ON (e.supervisorID=r1.employeeID));
```



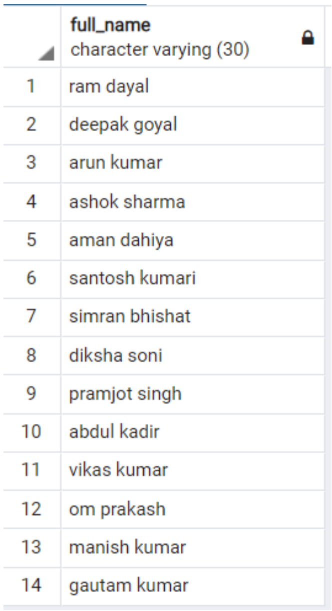
	employee character varying (30)	supervisor character varying (30)
1	Ram Sharma	Kapil Jain
2	Dev Gautam	Kapil Jain
3	Kartik Sharma	Hrithik Munjal
4	Jaimil Joshi	Hrithik Munjal
5	Prateek Budhani	ramdin verma
6	punit khandelwal	ramdin verma
7	sharat chandran	khadak singh
8	birender mandal	khadak singh
9	gurmit singh	chanderpal
10	manpreet kaur	yogeshwari goyait
11	rehana praveen	yogeshwari goyait
12	sweta kumari	parash das
13	manoj kumar	parash das
14	lalit kathuriya	radha devi
15	pooran chand	radha devi
16	aamir hussain	radha devi
17	kumari komal	anil kumar

Q6. List of employees working in the evening shift, from a particular location.

$r_1 \text{ <- } \sigma_{shift\_start\_time='14:00:00'}(\text{EMPLOYEE})$

$\Pi_{<full\_name>}(\sigma_{<location='Navrangpura'>}(r_1 \bowtie_{<r1.storeID=STORE.storeID>}(\text{STORE})))$

```
SELECT full_name FROM
          (SELECT * FROM EMPLOYEE
          WHERE shift_start_time= '14:00:00') as r1
JOIN STORE ON
(r1.storeID=STORE.storeID)
WHERE located= 'Navrangpura';
```



	full_name character varying (30)
1	ram dayal
2	deepak goyal
3	arun kumar
4	ashok sharma
5	aman dahiya
6	santosh kumari
7	simran bhishat
8	diksha soni
9	pramjot singh
10	abdul kadir
11	vikas kumar
12	om prakash
13	manish kumar
14	gautam kumar

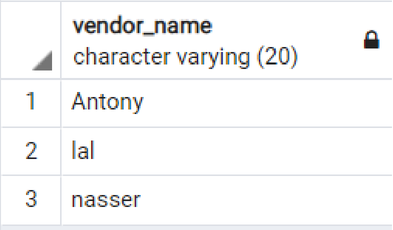
Q7. Retrieve the list of vendors supplying products, under category “xyz”.

r_1 <- $\sigma_{\text{<category\_name='Fruits and vegetables'>}}$(products $\bowtie_{\text{products.categoryID=category.categoryID}}$ category)

r_2<- $\sigma_{< >}$($r_1$$\bowtie_{\text{r1.productID=delivery_details.product_ID}}$ delivery_details)

$\Pi_{\text{<vendor\_name >}}$($r_2$$\bowtie_{\text{< r2.vendor_ID=vendor.vendorID >}}$(vendor))

```
SELECT distinct vendor_name FROM VENDOR JOIN
        (SELECT * FROM delivery_details JOIN
                (SELECT * FROM PRODUCTs JOIN CATEGORY
                        ON (products.categoryID=category.categoryID)
                        where category_name='Fruits and vegetables') as r1 ON
                (r1.productID=delivery_details.product_ID)
        ) as r2 ON (r2.vendor_ID=vendor.vendorID);
```



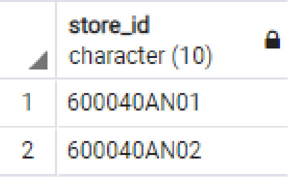
	vendor_name character varying (20)
1	Antony
2	lal
3	nasser

Q8. Retrieve the list of stores for which a particular vendor supplies.

r_1 <- $\sigma_{\text{<vendorname='xyz'>}}$(VENDOR)

Π_{storeID}($r_1$$\bowtie_{\text{<r1.vendorID=delivery_details.vendorID>}}$(DELIVERY_DETAILS))

```
SELECT distinct store_ID FROM DELIVERY_DETAILS JOIN(
        SELECT * FROM VENDOR
        WHERE vendor_name='bhaskar'
) as r1 ON
(r1.vendorID=delivery_details.vendor_ID);
```



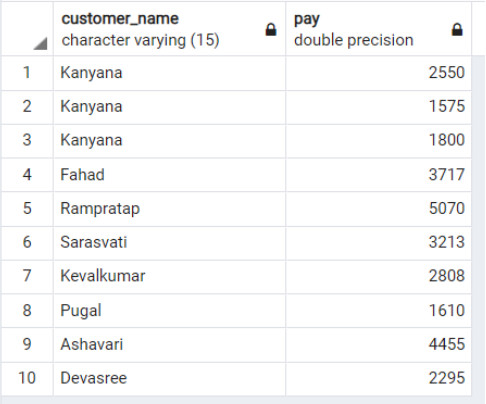
	store_id character (10)
1	600040AN01
2	600040AN02

Q9. Retrieve the list of customers who have transactions more than Rs. X.

R1<- $\sigma_{\text{<pay>1500>}}$ ($\Pi_{\text{customer\_name, (((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity)-(discount\_details/100)*((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity)-(special\_discount/100)*((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity))->pay}}$($\rho$(c,customer)$\bowtie_{\text{(c.customerID=t.customerid)}}$$\rho$(t,transaction)$\bowtie_{\text{(t.transaction\_id=m.transaction\_id)}}$$\rho$(m,madeon)$\bowtie_{\text{(m.productid=p.productid)}}$$\rho$(p,products))

R2<- $\Pi_{\text{customer\_name,pay}}$(R1)

```
SELECT customer_name,pay FROM(
          SELECT customer_name, (((COALESCE(cost_per_kg,0) +
          COALESCE(cost_per_packet,0) + COALESCE(mrp,0)) * quantity) -
          (discount_details/100) * ((COALESCE(cost_per_kg,0) +
          COALESCE(cost_per_packet,0) + COALESCE(mrp,0)) * quantity) -
          (special_discount/100) * ((COALESCE(cost_per_kg,0) +
          COALESCE(cost_per_packet,0) + COALESCE(mrp,0)) * quantity))
          as pay
FROM (((customer AS c JOIN transaction AS t ON (c.customerID = t.customerid)) as r1
JOIN madeon as m on (r1.transaction_id=m.transaction_id)) natural join products as p) as
r2) as r3
where pay>1500;
```



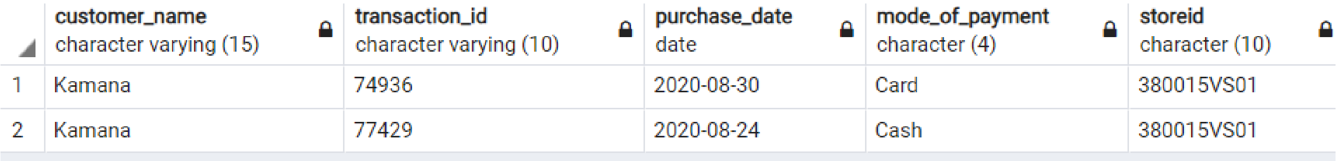
	customer_name character varying (15)	pay double precision
1	Kanyana	2550
2	Kanyana	1575
3	Kanyana	1800
4	Fahad	3717
5	Rampratap	5070
6	Sarasvati	3213
7	Kevalkumar	2808
8	Pugal	1610
9	Ashavari	4455
10	Devasree	2295

Q10. Retrieve the transaction details of a particular customer in the past 15 days.

$r_1 \leftarrow \sigma_{customer\_name='Kamana'}(customer)$

$\Pi_{customer\_name,transaction\_id,purchase\_date,mode\_of\_payment,storeid}(\sigma_{<purchase\_date >= Date'2020-08-30' - INTERVAL '15 days'>}(r_1 \bowtie_{< r1.customerID=customer.customerid >} customer))$

```
SELECT customer_name,transaction_id,purchase_date,mode_of_payment,storeid FROM
transaction JOIN
          (SELECT * FROM customer
          WHERE customer_name = 'Kamana')as r1 on
(r1.customerID=transaction.customerid)
where purchase_date >= Date'2020-08-30'-INTERVAL '15 days';
```



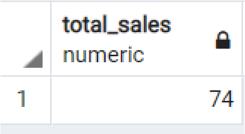
	customer_name character varying (15)	transaction_id character varying (10)	purchase_date date	mode_of_payment character (4)	storeid character (10)
1	Kamana	74936	2020-08-30	Card	380015VS01
2	Kamana	77429	2020-08-24	Cash	380015VS01

Q11. Retrieve the sales of a particular product for a given week.

$r_1 \text{ <- } \sigma_{\text{productname='minutemaid' AND date>=date'2020-08-15'-INTERVAL'7 days'}}(\text{TRANSACTION} \bowtie_{\text{<TRANSACTION.transactionID=MADE\_ON.transactionID>}} \text{MADE\_ON} \bowtie_{\text{<TRANSACTION.productID=MADE\_ON.productID>}} \text{products})$

$\mathscr{F}_{\text{SUM(amount\_paid)->total\_sales}}(r_1)$

```
SELECT SUM(Quantity) AS total_sales FROM
        (((SELECT * FROM TRANSACTION JOIN MADEON ON
                (TRANSACTION.transaction_ID=MADEON.transaction_ID)) as r1 JOIN
                products as p on (r1.productID=p.productid)))
where product_name='Minute Maid' AND purchase_date>= date'2020-08-15'-
INTERVAL'7 days';
```



	total_sales numeric
1	74

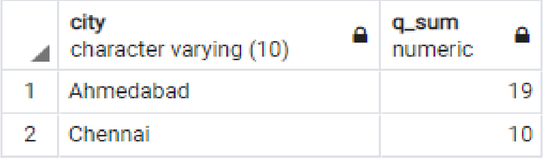
Q12. Retrieve the location with sales of a particular product in descending order.

$r_1 \text{<-} \sigma_{\text{<productname='ketchup'>}}(\rho(\text{MadeOn},M) \bowtie_{\text{(M.productID=p.productID)}} \rho(\text{product},p))$

$r_2 \text{<-} \Pi_{\text{city,Quantity}}(\rho(\text{store},s) \bowtie_{\text{(s.storeID=T.storeID)}} \rho(\text{transaction},T) \bowtie_{\text{(T.transactionID=r1.transactionID)}} r_1$

$\text{Result <- ORDER BY Q\_SUM desc } ({}_{\text{city}}\mathscr{F}_{\text{SUM(Quantity)->Q\_SUM}}(r_2))$

```
SELECT city,SUM(Quantity) as Q_SUM FROM(
        SELECT city,Quantity FROM store as s JOIN Transaction as T  ON
        (s.storeID=T.storeID) JOIN (
                SELECT * FROM MadeOn as m JOIN products as p ON
                (m.productID=p.productID) where product_name='Ketchup'
         ) as r1 ON (T.transaction_ID=r1.transaction_ID)
) as r2 GROUP BY city order by Q_SUM desc;
```

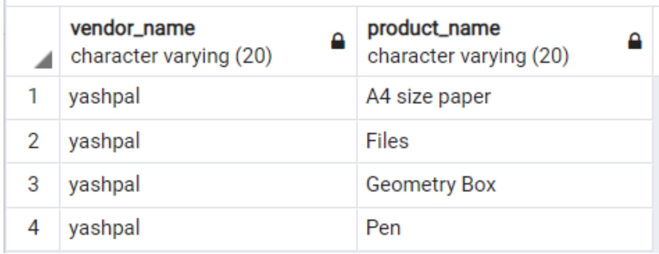


	city character varying (10)	q_sum numeric
1	Ahmedabad	19
2	Chennai	10

Q13. Products that are pending to be delivered by a particular vendor.

$\Pi_{\text{v.vendor\_name, p.product\_name}}(\sigma_{\text{v.vendor\_name='yashpal' AND arrival\_date>'2020-07-26'}}(\rho(v, \text{vendor}) \bowtie_{\text{<v.vendorID=d.vendor\_ID>}} \rho(d, \text{delivery\_details}) \bowtie_{\text{<p.productID=d.products\_ID>}} \rho(p, \text{products})))$

```
SELECT distinct v.vendor_name, p.product_name FROM vendor AS v JOIN
        delivery_details as d ON (v.vendorID=d.vendor_ID) JOIN
                products AS p on (p.productID=d.product_ID)
where v.vendor_name='yashpal' AND arrival_date>date'2020-07-26';
```

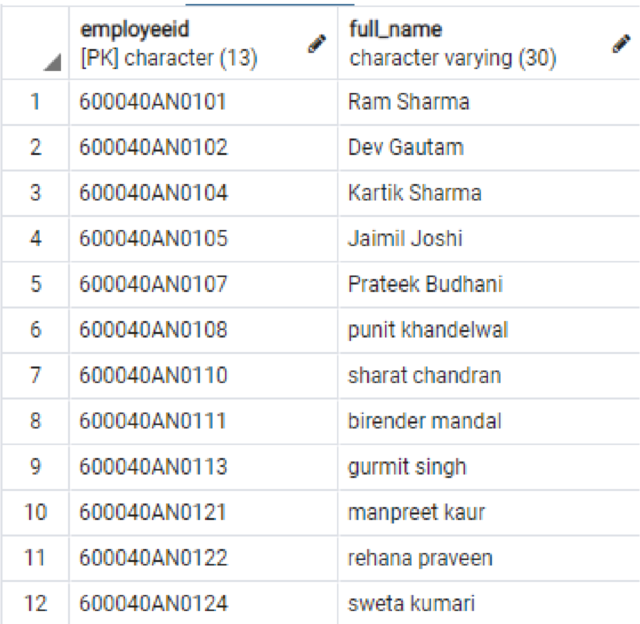


	vendor_name character varying (20)	product_name character varying (20)
1	yashpal	A4 size paper
2	yashpal	Files
3	yashpal	Geometry Box
4	yashpal	Pen

Q14. Retrieve the list of all employees under a designation "abc"

$\Pi_{\text{employeeID,full\_name}}(\sigma_{\text{designation="stock clerks"}}(\text{employee}))$

SELECT employeeID, full_name FROM employee
where designation='stock clerk';



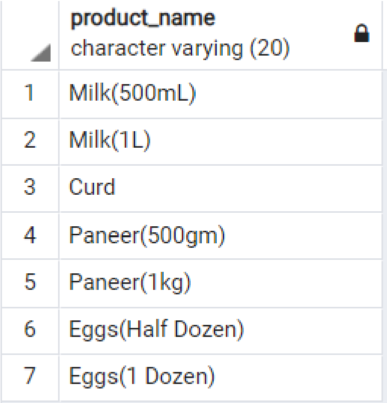
	employeeid [PK] character (13)	full_name character varying (30)
1	600040AN0101	Ram Sharma
2	600040AN0102	Dev Gautam
3	600040AN0104	Kartik Sharma
4	600040AN0105	Jaimil Joshi
5	600040AN0107	Prateek Budhani
6	600040AN0108	punit khandelwal
7	600040AN0110	sharat chandran
8	600040AN0111	birender mandal
9	600040AN0113	gurmit singh
10	600040AN0121	manpreet kaur
11	600040AN0122	rehana praveen
12	600040AN0124	sweta kumari

Q15. Retrieve the list of all products available under a particular category

$r_1 \leftarrow \Pi_{\text{categoryid}}\sigma_{\text{<categoryname='Dairy and eggs'>}}(\text{Category})$

$\text{result} \leftarrow \Pi_{\text{<product\_name>}}(\rho(\text{Product,P}) \text{ semi-join}_{(\text{P.CategoryID=r1.CategoryID})}\ r_1)$

SELECT product_name FROM Products
WHERE CategoryID IN (SELECT categoryid FROM Category WHERE Category_name = 'diary and eggs');

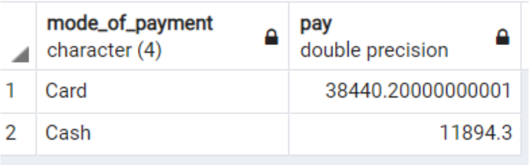


	product_name character varying (20)
1	Milk(500mL)
2	Milk(1L)
3	Curd
4	Paneer(500gm)
5	Paneer(1kg)
6	Eggs(Half Dozen)
7	Eggs(1 Dozen)

Q16. Retrieve the income generated by online payment and cash separately.

R1->($\Pi_{\text{mode\_of\_payment, (((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity)-(discount\_details/100)*((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity)-(special\_discount/100)*((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity))->pay}}$(ρ(c,customer)$\bowtie_{\text{(c.customerID=t.customerid)}}$ρ(t,transaction)$\bowtie_{\text{(t.transaction_id=m.transaction_id)}}$ρ(m,madeon)$\bowtie_{\text{(m.productid=p.productid)}}$ρ(p,products))

```
SELECT mode_of_payment, SUM((((COALESCE(cost_per_kg,0) +
COALESCE(cost_per_packet,0) + COALESCE(mrp,0))*quantity) -
(discount_details/100) * ((COALESCE(cost_per_kg,0) + COALESCE(cost_per_packet,0) +
COALESCE(mrp,0))*quantity) -
(special_discount/100) * ((COALESCE(cost_per_kg,0) + COALESCE(cost_per_packet,0) +
COALESCE(mrp,0)) * quantity)))
as pay
FROM (((customer AS c JOIN transaction AS t ON (c.customerID = t.customerid)) as r1
JOIN madeon as m on (r1.transaction_id=m.transaction_id)) natural join products as p) as r2
GROUP BY mode_of_payment;
```

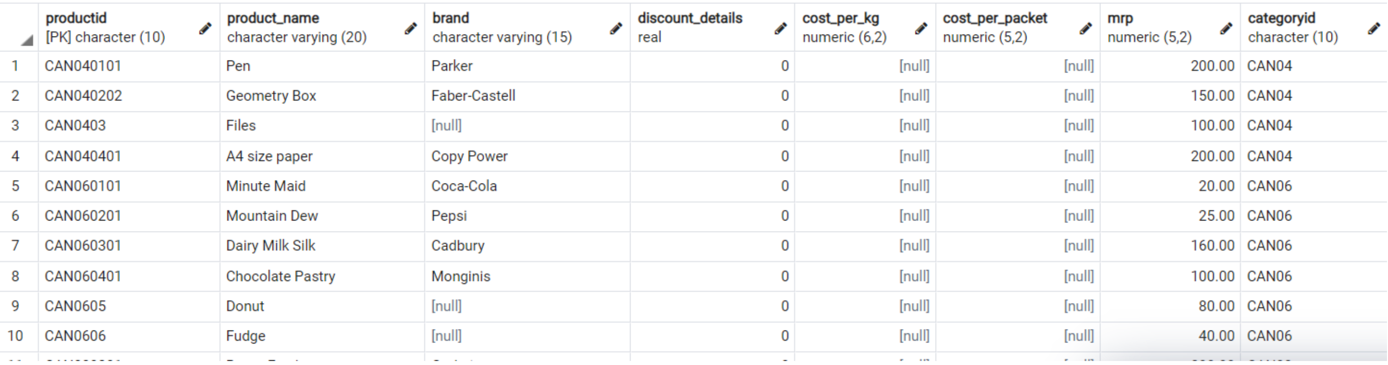


	mode_of_payment character (4)	pay double precision
1	Card	38440.20000000001
2	Cash	11894.3

Q17. Retrieve products with a discount of less than 10%.

$\sigma_{\text{Discountdetails<10}}$(Products)

```
SELECT * FROM products
WHERE discount_details<10;
```

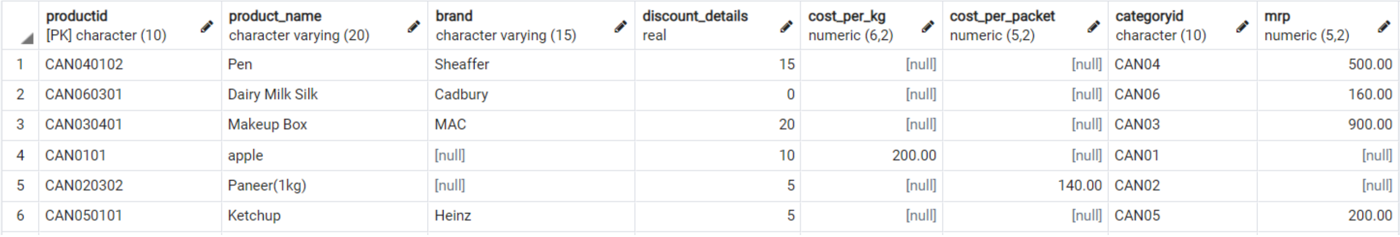


	productid [PK] character (10)	product_name character varying (20)	brand character varying (15)	discount_details real	cost_per_kg numeric (6,2)	cost_per_packet numeric (5,2)	mrp numeric (5,2)	categoryid character (10)
1	CAN040101	Pen	Parker	0	[null]	[null]	200.00	CAN04
2	CAN040202	Geometry Box	Faber-Castell	0	[null]	[null]	150.00	CAN04
3	CAN0403	Files	[null]	0	[null]	[null]	100.00	CAN04
4	CAN040401	A4 size paper	Copy Power	0	[null]	[null]	200.00	CAN04
5	CAN060101	Minute Maid	Coca-Cola	0	[null]	[null]	20.00	CAN06
6	CAN060201	Mountain Dew	Pepsi	0	[null]	[null]	25.00	CAN06
7	CAN060301	Dairy Milk Silk	Cadbury	0	[null]	[null]	160.00	CAN06
8	CAN060401	Chocolate Pastry	Monginis	0	[null]	[null]	100.00	CAN06
9	CAN0605	Donut	[null]	0	[null]	[null]	80.00	CAN06
10	CAN0606	Fudge	[null]	0	[null]	[null]	40.00	CAN06

Q18. List the product details with the maximum price at each category.

r1 <- $\sigma_{mrp}\mathscr{F}$MAX(MRP),$\sigma_{costperkg}\mathscr{F}$MAX(Costperkg),$\sigma_{costperpacket}\mathscr{F}$MAX(Costperpacket)
(Product) ⋈ $_{<products.categoryID=category.categoryID>}$(Category) ->ABC
result <- $_{<p.mrp\ or\ p.costperkg\ or\ p.costperpacket>}$ (r1) ⋈$_{<p.categoryID=ABC.categoryID>}$ (Products)

SELECT productID, product_name, Brand, discount_details, cost_per_kg, cost_per_packet, p.categoryID, MRP FROM products as p JOIN
(SELECT MAX(MRP) as max_mrp, MAX(cost_per_kg) as max_costperkg, MAX(cost_per_packet) as max_costperpacket, products.categoryID FROM products JOIN category on (products.categoryID = category.categoryID) GROUP BY products.categoryID) as ABC on
((p.categoryID = ABC.categoryID) and (p.MRP = ABC.max_mrp) or (p.cost_per_kg = ABC.max_costperkg) or (p.cost_per_packet = ABC.max_costperpacket));

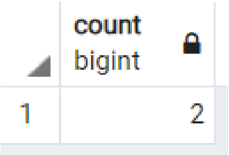


	productid [PK] character (10)	product_name character varying (20)	brand character varying (15)	discount_details real	cost_per_kg numeric (6,2)	cost_per_packet numeric (5,2)	categoryid character (10)	mrp numeric (5,2)
1	CAN040102	Pen	Sheaffer	15	[null]	[null]	CAN04	500.00
2	CAN060301	Dairy Milk Silk	Cadbury	0	[null]	[null]	CAN06	160.00
3	CAN030401	Makeup Box	MAC	20	[null]	[null]	CAN03	900.00
4	CAN0101	apple	[null]	10	200.00	[null]	CAN01	[null]
5	CAN020302	Paneer(1kg)	[null]	5	[null]	140.00	CAN02	[null]
6	CAN050101	Ketchup	Heinz	5	[null]	[null]	CAN05	200.00

Q19. Retrieve the number of days absent by an employee in a month.

r1<-σ $_{<full\_name\ =\ 'Dev\ Gautam'\ and\ status='A'\ and\ DATE>='2020-08-31\ -interval'30days'>}$
(ρ(e,employee)⋈$_{(e.employeeID=fills.employeeID)}$fills)
result<-$\mathscr{F}_{count(status)}$(r1)

SELECT COUNT(status) FROM employee NATURAL JOIN fills
WHERE full_name = 'Dev Gautam' AND status = 'A' AND
work_DATE>=date'2020-08-31'-interval'30days';



	count bigint
1	2

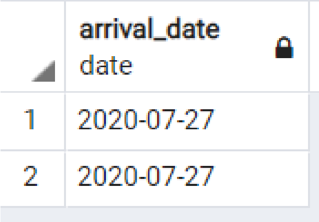
Q20. Arrival date of a particular product to a particular store.

$\text{R1<-}\rho(\text{store,s})\bowtie_{\text{(d..storeID=s.storeID)}}\rho(\text{delivery\_details,d})\bowtie_{\text{(d.productID=p.productID)}}(\text{product})$

$\text{R2<-}\sigma_{\text{<productname='pen' and storeid=' 600040AN02'>}}\text{R1}$

$\text{result<-}\Pi_{\text{<arrival\_date>}}\text{R1}$

```
SELECT arrival_date FROM (store as s JOIN delivery_details as d
ON(s.storeID=d.store_ID)) AS r JOIN products as p ON (r.product_ID=p.productID)
WHERE product_name='Pen' and storeid='600040AN02';
```

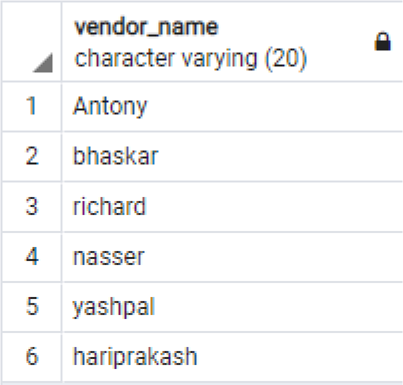


	arrival_date date
1	2020-07-27
2	2020-07-27

Q21. List of vendors supplying to a store.

$\Pi_{\text{vendorname}}(\sigma_{\text{<storeID='600040AN01'>}}(\rho(\text{delivery\_details})\bowtie_{\text{(delivery\_details.vendorID=v.vendorID)}}\rho(\text{vendor,v})))$

```
SELECT distinct vendor_name FROM delivery_details JOIN  vendor ON
(delivery_details.vendor_ID=Vendor.vendorID)
WHERE store_ID='600040AN01';
```

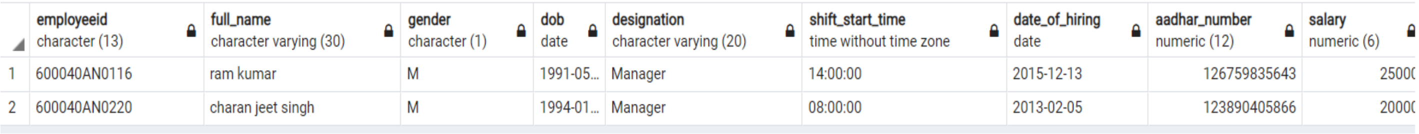


	vendor_name character varying (20)
1	Antony
2	bhaskar
3	richard
4	nasser
5	yashpal
6	hariprakash

Q22. List of managers managing the stores under a particular location

$\text{R1<-}\sigma_{\text{<location='anna nagar' AND is\_manager>}}\rho(\text{employee,e})\bowtie_{\text{(e..storeID=s.storeID)}}\rho(\text{store,s})$

```
SELECT * FROM employee as e JOIN store as s ON (e.storeID=s .storeID)
WHERE is_manager and located='Anna Nagar';
```



	employeeid character (13)	full_name character varying (30)	gender character (1)	dob date	designation character varying (20)	shift_start_time time without time zone	date_of_hiring date	aadhar_number numeric (12)	salary numeric (6)
1	600040AN0116	ram kumar	M	1991-05...	Manager	14:00:00	2015-12-13	126759835643	2500(
2	600040AN0220	charan jeet singh	M	1994-01...	Manager	08:00:00	2013-02-05	123890405866	2000(

Q23. Retrieve customers with most transactions by store.

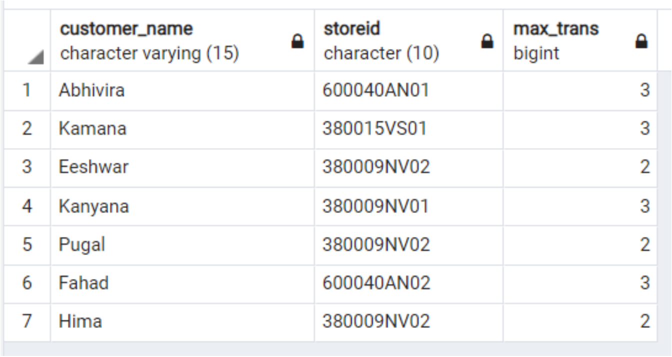
r1<-$_{\text{storeID,customerID}}\mathscr{F}_{\text{COUNT(TransactionID)->trans\_count}}$(Transaction)

r4<-$_{\text{storeID}}\mathscr{F}_{\text{MAX(trans\_count)->max\_trans}}$(r1)

r2<-$\Pi_{\text{customerID,customername,storeID,trans\_count}}$(ρ(c,customer)$\bowtie_{\text{(c.customerID=r1.customerID)}}$r1)

r3<-$\Pi_{\text{customername,r3.storeID,max\_trans}}$(r2$\bowtie_{\text{(r2.storeID=r4.storeID AND r2.max_trans=r4.trans_count)}}$r4)

```
SELECT customer_name,r3.storeID,max_trans FROM (
    (SELECT c.customerID ,customer_name,storeID,trans_count FROM customer AS c
    JOIN
        (SELECT storeID,customerID,COUNT(Transaction_ID)
        AS trans_count from transaction GROUP BY storeID,customerID) as r1 ON
        (c.customerID=r1.customerID)) as r2 JOIN
            (SELECT storeID,MAX (Trans_count) as max_trans FROM
                (SELECT storeID,customerID,COUNT(Transaction_ID) AS
                trans_count from transaction GROUP BY storeID,customerID
            ) as r4 GROUP BY storeID) as r3 ON (r2.storeID=r3.storeID
        AND r2.trans_count=r3.max_trans)
    );
```



	customer_name character varying (15)	storeid character (10)	max_trans bigint
1	Abhivira	600040AN01	3
2	Kamana	380015VS01	3
3	Eeshwar	380009NV02	2
4	Kanyana	380009NV01	3
5	Pugal	380009NV02	2
6	Fahad	600040AN02	3
7	Hima	380009NV02	2

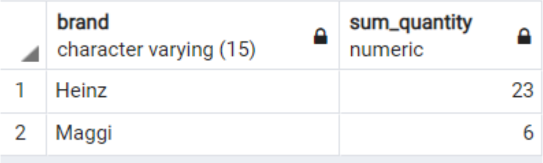
Q24. Retrieve sales of brand of a particular product.

r1<-$\Pi_{\text{productID,brand}}$($\boldsymbol{\sigma}_{<\text{productname='ketchup'}>}$(product)

r2<-ρ(m,MadeOn)$\bowtie_{\text{(m.productID=r1.productID)}}$r1

result<-$_{\text{brand}}\mathscr{F}_{\text{SUM(Quantity)->SUM\_Quantity}}$(r2)

```
select brand,Sum(Quantity) as sum_Quantity from
    (SELECT * FROM MadeOn as m JOIN
        (SELECT productID,brand FROM products
        WHERE product_name='Ketchup'
        ) as r1 ON (m.productID=r1.productID)
 ) as r2 group by brand
 order by sum_Quantity desc;
```

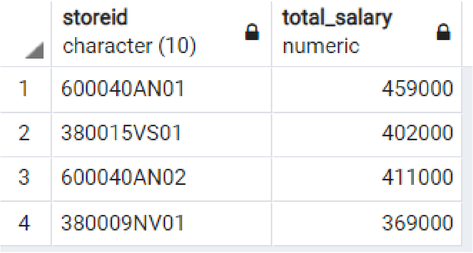


	brand character varying (15)	sum_quantity numeric
1	Heinz	23
2	Maggi	6

Q25. Find the total salary to be paid to all employees store-wise.

$_{\text{storeID}}\mathcal{F}_{\text{SUM (salary)-> total\_salary}}$ (employee)

```
SELECT storeID, SUM(salary) AS total_salary FROM employee GROUP BY storeID;
```

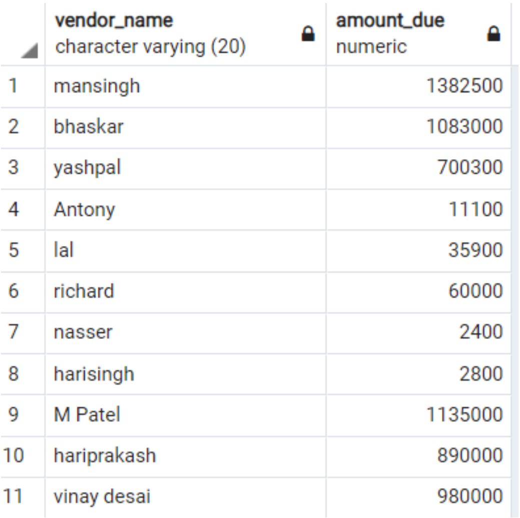


	storeid character (10)	total_salary numeric
1	600040AN01	459000
2	380015VS01	402000
3	600040AN02	411000
4	380009NV01	369000

Q26. Total due amount to be paid to each vendor.

$\Pi_{\text{vendor\_name, COALESCE(totalkgs,0) + COALESCE(totalpackets,0) + COALESCE(totalcartons,0) -> amount\_due}}$ $(\sigma_{\text{SELECT v.vendor\_name,SUM(w.cost\_per\_kg *d.quantity\_in\_kgs) -> totalkgs,SUM(w.cost\_per\_packet *d.quantity\_in\_packets) -> totalpackets,SUM(w.cost\_per\_carton *d.number\_of\_cartons) -> totalcartons}})$ $(\rho(\text{vendor},v) \bowtie_{\text{(v.vendorid = d.vendor\_id)}} \rho(\text{delivery\_details},d) \bowtie_{\text{(d.product\_id = w.productid)}} \rho(\text{wholesale\_price},w)$
Result <- ORDER BY vendor_name$(\sigma_{\text{<d.payment_status='false'>}})$

```
SELECT vendor_name, COALESCE(totalkgs,0) + COALESCE(totalpackets,0) +
COALESCE(totalcartons,0) as amount_due from(
        SELECT v.vendor_name,
        SUM(w.cost_per_kg *d.quantity_in_kgs) as totalkgs,
        SUM(w.cost_per_packet *d.quantity_in_packets) as totalpackets,
        SUM(w.cost_per_carton *d.number_of_cartons) as totalcartons
        FROM vendor as v JOIN delivery_details as d ON (v.vendorid = d.vendor_id) JOIN
        wholesale_price as w ON
        (d.product_id = w.productid)
        where d.payment_status='false'
        group by v.vendor_name
) as result;
```



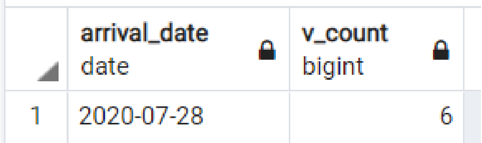
	vendor_name character varying (20)	amount_due numeric
1	mansingh	1382500
2	bhaskar	1083000
3	yashpal	700300
4	Antony	11100
5	lal	35900
6	richard	60000
7	nasser	2400
8	harisingh	2800
9	M Patel	1135000
10	hariprakash	890000
11	vinay desai	980000

Q27. Count the vendors supplying products on a particular arrival date.

r1<-$\Pi_{<arrival\_date='2020-07-28'>}$(delivery_details)

r2<- $_{arrival\_date}\mathscr{F}_{COUNT(vendorID)->V\_count}$(r1)

SELECT arrival_date,COUNT(DISTINCT vendor_ID) as V_Count
FROM delivery_details
WHERE arrival_date=date'2020-07-28' GROUP BY arrival_date;



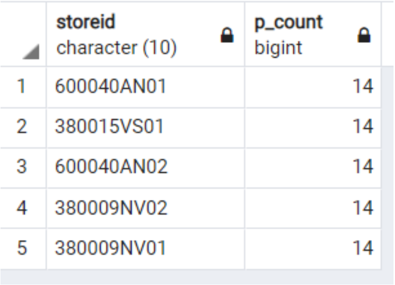
	arrival_date date	v_count bigint
1	2020-07-28	6

Q28. Count the products within 10 days prior the expiry date store-wise.

r1<-$\Pi_{<expiry\_date<=date'2020-08-25'+interval'10 days'>}$(contains)

r2<- $_{storeID}\mathscr{F}_{COUNT(productID)->p\_count}$(r1)

SELECT storeId,COUNT(productID) as p_count FROM contains
WHERE expiry_date<= date'2020-08-25'+INTERVAL '10 DAYS'
GROUP BY storeID;



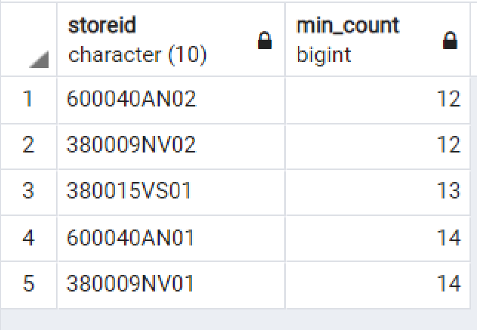
	storeid character (10)	p_count bigint
1	600040AN01	14
2	380015VS01	14
3	600040AN02	14
4	380009NV02	14
5	380009NV01	14

Q29. List the stores with customer flow in ascending order.

r1<- ${}_{\text{storeID}}\mathscr{F}_{\text{COUNT(transactionID)->trans\_count}}$(transaction)

r2<-ORDER BY MINCOUNT(${}_{\text{storeID}}\mathscr{F}_{\text{MIN(trans\_count)->MIN\_count}}$(r1))

```
SELECT storeID,MIN(trans_count) as MIN_count FROM
        (SELECT storeID , COUNT (transaction_ID) AS trans_count FROM transaction
        GROUP BY storeID) as r1
GROUP BY storeID order by min_count;
```



	storeid character (10)	min_count bigint
1	600040AN02	12
2	380009NV02	12
3	380015VS01	13
4	600040AN01	14
5	380009NV01	14

Q30. Name the store with minimum revenue.

r1<- ${}_{\text{storeID}}\mathscr{F}_{\text{SUM(((coalesce(cost\_perkg,0)+coalesce(cost\_per\_packet,0)+coalesce(MRP,0))*Quanity)-(discount\_details/100)* ((coalesce(cost\_perkg,0)+coalesce(cost\_per\_packet,0)+coalesce(MRP,0))*Quanity)- (special\_discount/100)*((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity))->pay}}$(**ρ**(c,customer)$\bowtie_{\text{(c.customerID=t.customerid)}}$**ρ**(t,transaction)$\bowtie_{\text{(t.transaction\_id=m.transaction\_id)}}$**ρ**(m,madeon)$\bowtie_{\text{(m.productid=p.productid)}}$**ρ**(p,products)

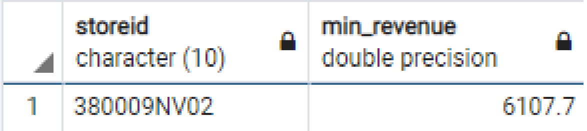
r2<-${}_{\text{storeID}}\mathscr{F}_{\text{SUM(pay)->revenue}}$(r1)

r3<-$\mathscr{F}_{\text{MIN(revenue)}}$(r2)

r4<-${}_{\text{storeID}}\mathscr{F}_{\text{SUM(((coalesce(cost\_perkg,0)+coalesce(cost\_per\_packet,0)+coalesce(MRP,0))*Quanity)-(discount\_details/100)* ((coalesce(cost\_perkg,0)+coalesce(cost\_per\_packet,0)+coalesce(MRP,0))*Quanity)- (special\_discount/100)*((COALESCE(cost\_per\_kg,0)+COALESCE(cost\_per\_packet,0)+COALESCE(mrp,0))*quantity))->pay1}}$(**ρ**(c,customer)$\bowtie_{\text{(c.customerID=t.customerid)}}$**ρ**(t,transaction)$\bowtie_{\text{(t.transaction\_id=m.transaction\_id)}}$**ρ**(m,madeon)$\bowtie_{\text{(m.productid=p.productid)}}$**ρ**(p,products)

r5<-**σ**$_{\text{<min\_revenue=r3>storeID}}\mathscr{F}_{\text{SUM(pay1)->min\_revenue}}$(r4)

```
SELECT storeid,SUM(pay1) as min_revenue FROM
        (SELECT storeid, customer_name,(((COALESCE(cost_per_kg,0) +
        COALESCE(cost_per_packet,0) + COALESCE(mrp,0))*quantity) -
        (discount_details/100) * ((COALESCE(cost_per_kg,0) +
        COALESCE(cost_per_packet,0) + COALESCE(mrp,0)) * quantity) -
        (special_discount/100) * ((COALESCE(cost_per_kg,0) +
        COALESCE(cost_per_packet,0) + COALESCE(mrp,0))*quantity))
as pay1 FROM customer AS c
JOIN transaction AS t ON c.customerID = t.customerid
JOIN madeon as m on t.transaction_id=m.transaction_id natural join products as p
) as r1 GROUP BY storeid
HAVING SUM(pay1) =
(SELECT MIN(revenue) FROM(
        SELECT storeid,SUM(pay) as revenue FROM(
                SELECT storeid, customer_name,(((COALESCE(cost_per_kg,0) +
                COALESCE(cost_per_packet,0) + COALESCE(mrp,0))*quantity) -
                (discount_details/100) * ((COALESCE(cost_per_kg,0) +
                COALESCE(cost_per_packet,0) + COALESCE(mrp,0)) * quantity) -
                (special_discount/100) * ((COALESCE(cost_per_kg,0) +
                COALESCE(cost_per_packet,0) + COALESCE(mrp,0)) * quantity))
        as pay
        FROM customer AS c
        JOIN transaction AS t ON c.customerID = t.customerid
        join madeon as m on t.transaction_id=m.transaction_id natural join products as p
        ) as r2 GROUP BY storeid
) as r3 ) ;
```



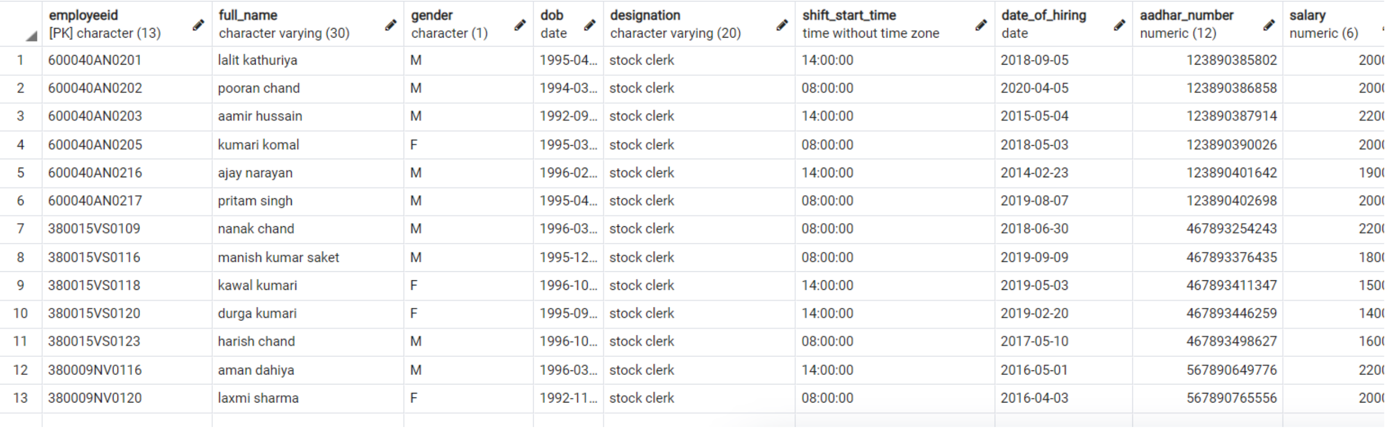
	storeid character (10)	min_revenue double precision
1	380009NV02	6107.7

Q31. List the details of employees whose salary is more than their supervisors.

R1<- $\Pi_{salary}(\boldsymbol{\rho}(e2,employee))$

R2<-$\boldsymbol{\sigma}_{<e1.salary>R1>}\ \boldsymbol{\rho}(e1,employee)$

```
select * from employee as e1 where e1.salary >
(select salary from employee as e2 where e2.employeeid =e1.supervisorid);
```

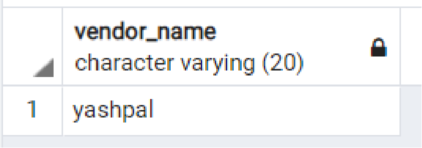


	employeeid [PK] character (13)	full_name character varying (30)	gender character (1)	dob date	designation character varying (20)	shift_start_time time without time zone	date_of_hiring date	aadhar_number numeric (12)	salary numeric (6)
1	600040AN0201	lalit kathuriya	M	1995-04...	stock clerk	14:00:00	2018-09-05	123890385802	200
2	600040AN0202	pooran chand	M	1994-03...	stock clerk	08:00:00	2020-04-05	123890386858	200
3	600040AN0203	aamir hussain	M	1992-09...	stock clerk	14:00:00	2015-05-04	123890387914	220
4	600040AN0205	kumari komal	F	1995-03...	stock clerk	08:00:00	2018-05-03	123890390026	200
5	600040AN0216	ajay narayan	M	1996-02...	stock clerk	14:00:00	2014-02-23	123890401642	190
6	600040AN0217	pritam singh	M	1995-04...	stock clerk	08:00:00	2019-08-07	123890402698	200
7	380015VS0109	nanak chand	M	1996-03...	stock clerk	08:00:00	2018-06-30	467893254243	220
8	380015VS0116	manish kumar saket	M	1995-12...	stock clerk	08:00:00	2019-09-09	467893376435	180
9	380015VS0118	kawal kumari	F	1996-10...	stock clerk	14:00:00	2019-05-03	467893411347	150
10	380015VS0120	durga kumari	F	1995-09...	stock clerk	14:00:00	2019-02-20	467893446259	140
11	380015VS0123	harish chand	M	1996-10...	stock clerk	08:00:00	2017-05-10	467893498627	160
12	380009NV0116	aman dahiya	M	1996-03...	stock clerk	14:00:00	2016-05-01	567890649776	220
13	380009NV0120	laxmi sharma	F	1992-11...	stock clerk	08:00:00	2016-04-03	567890765556	200

Q32. Name the vendors who supply for all stores.

r1<-$\Pi_{vendorid,storeid}$(vendorXstore)
r2<-r1-($\Pi_{vendorid,storeid}$(delivery_details))
r2x<-$\Pi_{vendorid}$(r2)
r3<-$\Pi_{vendorid}$(delivery_details)-r2x
result<-Π_{vendor_name}(vendor$\bowtie_{(vendor.vendorid=r3.vendorid)}$r3)

```
select vendor_name from(
        vendor as v join (select distinct vendor_id from delivery_details except
        (select vendorid from
                (select vendorid,storeid from vendor,store except
                        (select distinct vendor_id,store_id from delivery_details)) as r2)
) as r1 on (v.vendorid=r1.vendor_id));
```



	vendor_name character varying (20)
1	yashpal