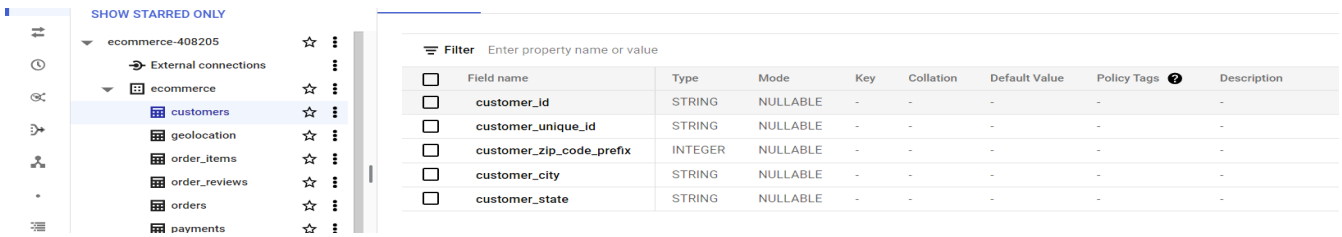
1. Import the dataset and do usual exploratory analysis steps like checking the structure & characteristics of the dataset:
   a. Data type of all columns in the "customers" table.
   b. Get the time range between which the orders were placed.
   c. Count the Cities & States of customers who ordered during the given period.

   a ans) the columns in the customer table are mentioned below and the data types are correct with respective to the each field



Field name	Type	Mode	Key	Collation	Default Value	Policy Tags	Description
customer_id	STRING	NULLABLE	-	-	-	-	-
customer_unique_id	STRING	NULLABLE	-	-	-	-	-
customer_zip_code_prefix	INTEGER	NULLABLE	-	-	-	-	-
customer_city	STRING	NULLABLE	-	-	-	-	-
customer_state	STRING	NULLABLE	-	-	-	-	-

   B ans) The data has a time range from 2016-09 to 2018-10 where the orders are placed

```
SELECT min(order_purchase_timestamp) as min_range,max(order_purchase_timestamp) as max_range
FROM `ecommerce-408205.ecommerce.orders`
LIMIT 1000
```

   C ans) there were 4119 cities and 27 state

```
SELECT count(distinct customer_city) as city_count, count(distinct customer_state) as state_count
FROM `ecommerce-408205.ecommerce.customers`
```

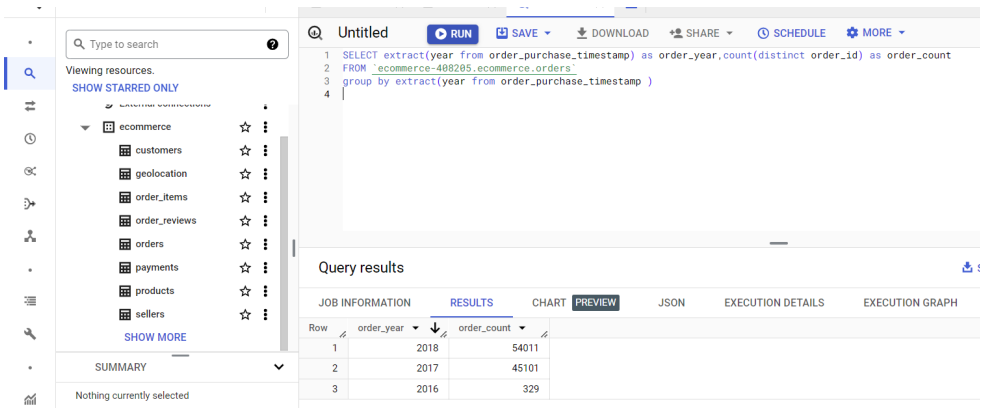
2.In-depth Exploration:

   a. Is there a growing trend in the no. of orders placed over the past years?
   b. Can we see some kind of monthly seasonality in terms of the no. of orders being placed?
   c. During what time of the day, do the Brazilian customers mostly place their orders? (Dawn, Morning, Afternoon or Night)

i. 0-6 hrs : Dawn
ii. 7-12 hrs : Mornings
iii. 13-18 hrs : Afternoon
iv. 19-23 hrs : Night

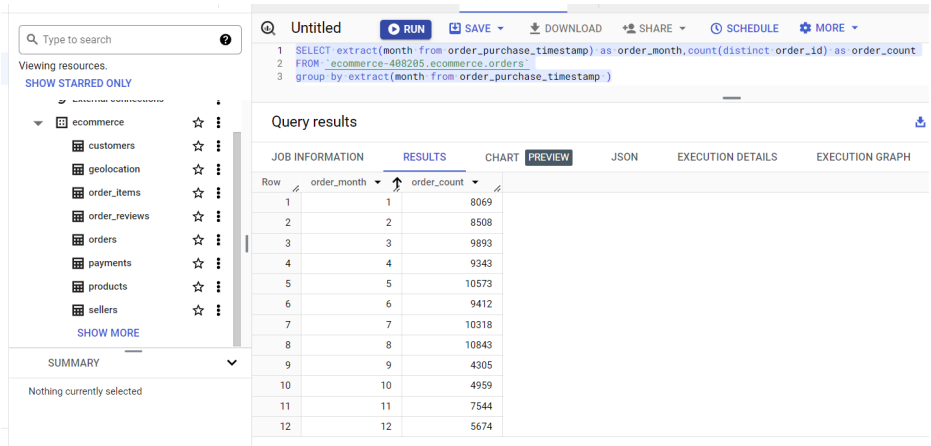
2a ans) since the 2016 orders data is for a period of 4months , we can neglect that. We can see a growth trend from 2017 to 2018.

```
SELECT extract(year from order_purchase_timestamp) as order_year,count(distinct order_id) as order_count
FROM `ecommerce-408205.ecommerce.orders`
group by extract(year from order_purchase_timestamp )
```



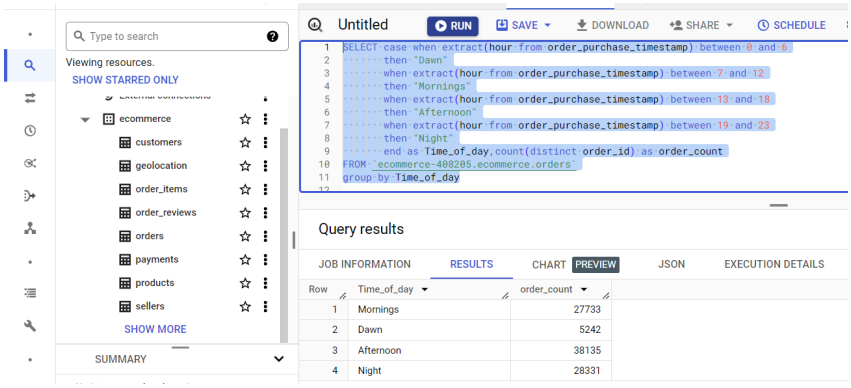
2b ans) there is a spike up in numbers during the month of may,july and August.near flat trend in the month of jan to april.flat declined numbers in the month of sep to dec.

```
SELECT extract(month from order_purchase_timestamp) as order_month,count(distinct order_id) as order_count
FROM `ecommerce-408205.ecommerce.orders`
group by extract(month from order_purchase_timestamp )
```



2c ans) the orders during dawn is the lowest, orders in the afternoon is the highest

```
SELECT case when extract(hour from order_purchase_timestamp) between 0 and 6
    then "Dawn"
    when extract(hour from order_purchase_timestamp) between 7 and 12
    then "Mornings"
    when extract(hour from order_purchase_timestamp) between 13 and 18
    then "Afternoon"
    when extract(hour from order_purchase_timestamp) between 19 and 23
    then "Night"
    end as Time_of_day,count(distinct order_id) as order_count
FROM `ecommerce-408205.ecommerce.orders`
group by Time_of_day
```

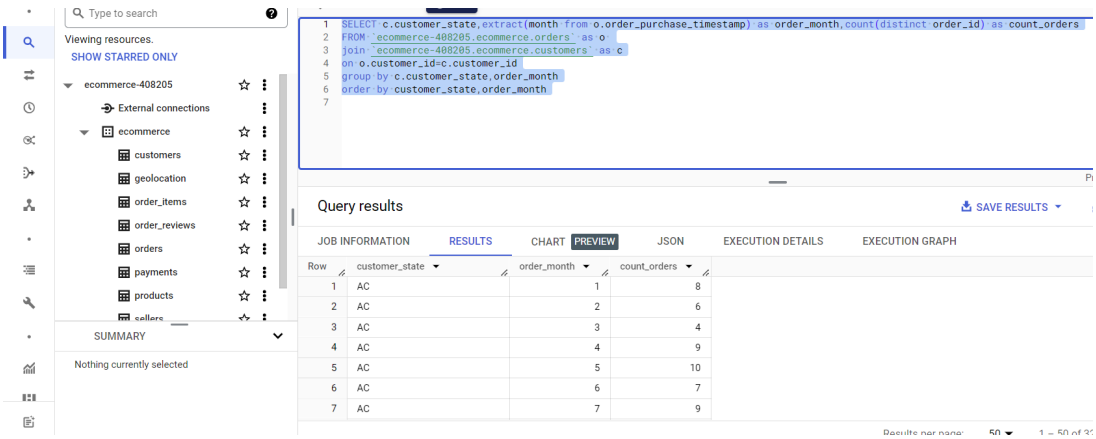


3) Evolution of E-commerce orders in the Brazil region:

A. Get the month on month no. of orders placed in each state.
B. How are the customers distributed across all the states?

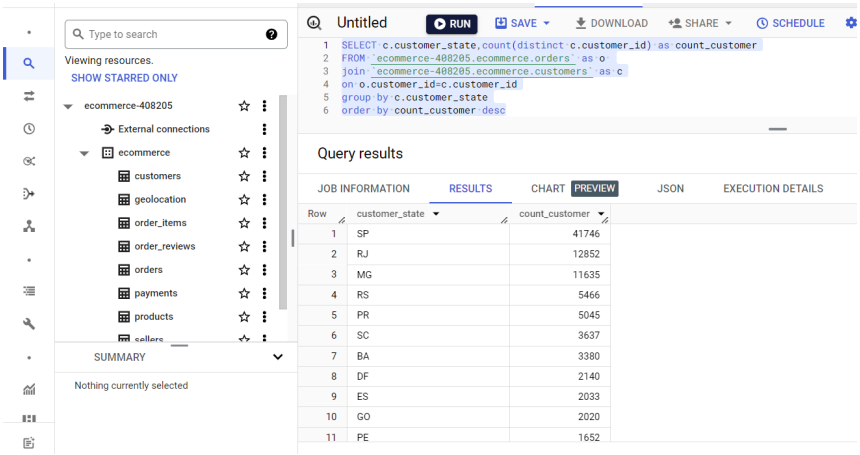
3a ans)

```
SELECT c.customer_state,extract(month from o.order_purchase_timestamp) as order_month,count(distinct order_id) as count_orders
FROM `ecommerce-408205.ecommerce.orders` as o
join `ecommerce-408205.ecommerce.customers` as c
on o.customer_id=c.customer_id
group by c.customer_state,order_month
order by customer_state,order_month
```



3b ans)

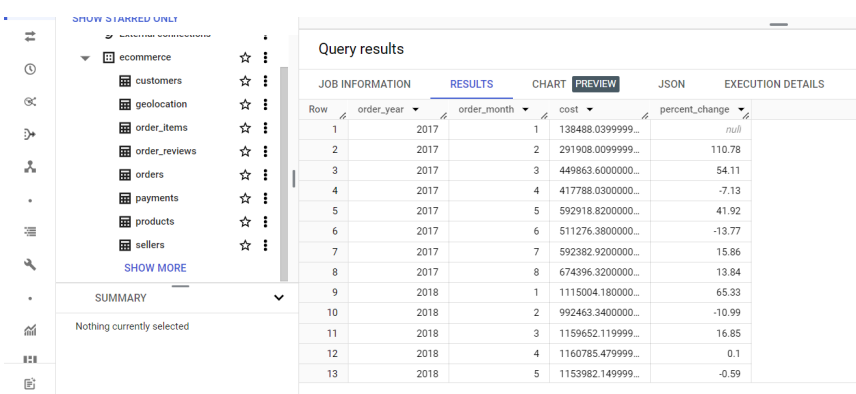
```
SELECT c.customer_state,count(distinct c.customer_id) as count_customer
FROM `ecommerce-408205.ecommerce.orders` as o
join `ecommerce-408205.ecommerce.customers` as c
on o.customer_id=c.customer_id
group by c.customer_state
order by count_customer desc
```



4.Impact on Economy: Analyze the money movement by e-commerce by looking at order prices, freight and others.

A. Get the % increase in the cost of orders from year 2017 to 2018 (include months between Jan to Aug only).
   You can use the "payment_value" column in the payments table to get the cost of orders.
B. Calculate the Total & Average value of order price for each state.
C. Calculate the Total & Average value of order freight for each state.

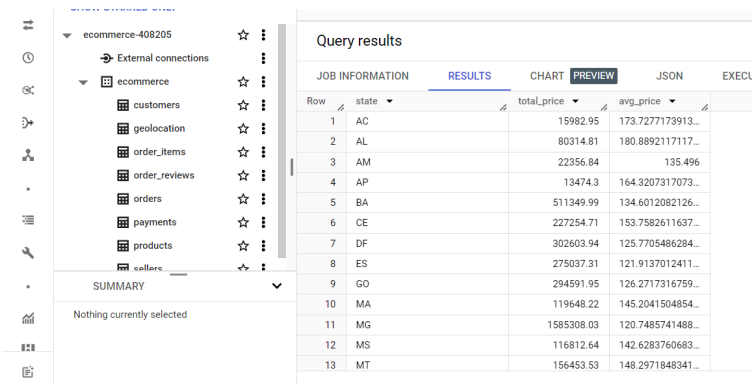
4a ans)
```
select order_year,order_month,cost,round(((cost-prev_cost)/prev_cost)*100,2)
as percent_change
from
(
select *,lag(cost,1,null) over(order by order_year,order_month) as prev_cost
from
(
SELECT extract(Year from order_purchase_timestamp) as order_year,
    extract(Month from order_purchase_timestamp) as order_month,
    sum(p.payment_value) as cost
FROM `ecommerce-408205.ecommerce.orders` as o
join `ecommerce-408205.ecommerce.payments` as p
on o.order_id=p.order_id
group by order_year,order_month
)
where order_month between 1 AND 8
order by order_year,order_month asc
)
```



Row	order_year	order_month	cost	percent_change
1	2017	1	138488.0399999...	null
2	2017	2	291908.0099999...	110.78
3	2017	3	449863.6000000...	54.11
4	2017	4	417788.0300000...	-7.13
5	2017	5	592918.8200000...	41.92
6	2017	6	511276.3800000...	-13.77
7	2017	7	592382.9200000...	15.86
8	2017	8	674396.3200000...	13.84
9	2018	1	1115004.180000...	65.33
10	2018	2	992463.3400000...	-10.99
11	2018	3	1159652.119999...	16.85
12	2018	4	1160785.479999...	0.1
13	2018	5	1153982.149999...	-0.59

4b ans)

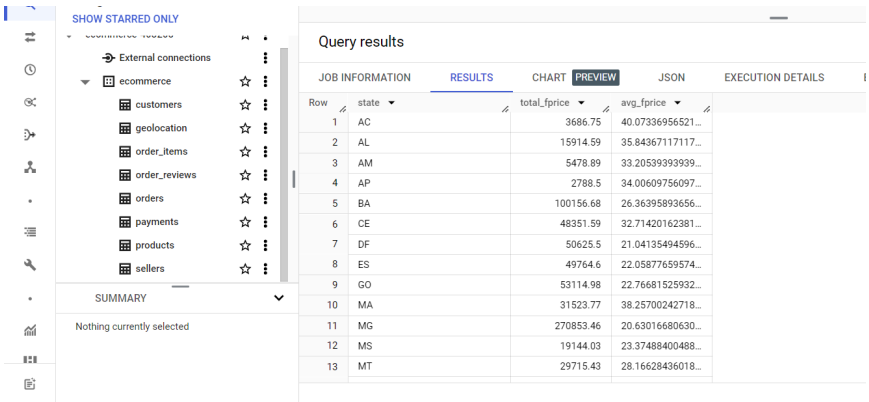
```
select distinct state,total_price,avg_price
from
(
select c.customer_state as state,sum(oi.price) over(partition by c.customer_state) as total_price,
    avg(oi.price) over(partition by c.customer_state) as avg_price
from `ecommerce-408205.ecommerce.orders` as o
join `ecommerce-408205.ecommerce.customers` as c
on o.customer_id=c.customer_id
left join `ecommerce-408205.ecommerce.order_items` as oi
on o.order_id=oi.order_id
order by c.customer_state asc
)
order by state asc
```



Row	state	total_price	avg_price
1	AC	15982.95	173.7277173913...
2	AL	80314.81	180.8892117117...
3	AM	22356.84	135.496
4	AP	13474.3	164.3207317073...
5	BA	511349.99	134.6012082126...
6	CE	227254.71	153.7582611637...
7	DF	302603.94	125.7705486284...
8	ES	275037.31	121.9137012411...
9	GO	294591.95	126.2717316759...
10	MA	119648.22	145.2041504854...
11	MG	1585308.03	120.7485741488...
12	MS	116812.64	142.6283760683...
13	MT	156453.53	148.2971848341...

4c ans)

```
select distinct state,total_fprice,avg_fprice
from
(
select c.customer_state as state,sum(oi.freight_value) over(partition by c.customer_state) as total_fprice,
    avg(oi.freight_value) over(partition by c.customer_state) as avg_fprice
from `ecommerce-408205.ecommerce.orders` as o
join `ecommerce-408205.ecommerce.customers` as c
on o.customer_id=c.customer_id
left join `ecommerce-408205.ecommerce.order_items` as oi
on o.order_id=oi.order_id
order by c.customer_state asc
)order by state asc
```



Row	state	total_fprice	avg_fprice
1	AC	3686.75	40.07336956521...
2	AL	15914.59	35.84367117117...
3	AM	5478.89	33.20539393939...
4	AP	2788.5	34.00609756097...
5	BA	100156.68	26.36395893656...
6	CE	48351.59	32.71420162381...
7	DF	50625.5	21.04135494596...
8	ES	49764.6	22.05877659574...
9	GO	53114.98	22.76681525932...
10	MA	31523.77	38.25700242718...
11	MG	270853.46	20.63016680630...
12	MS	19144.03	23.37488400488...
13	MT	29715.43	28.16628436018...

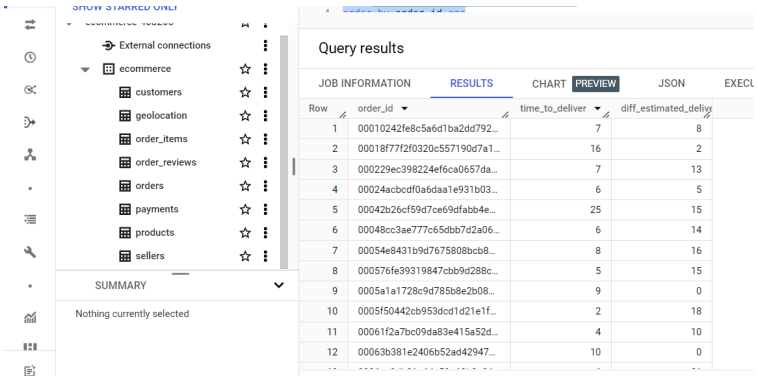
5.Analysis based on sales, freight and delivery time.

A. Find the no. of days taken to deliver each order from the order's purchase date as delivery time.
   Also, calculate the difference (in days) between the estimated & actual delivery date of an order.
   Do this in a single query.

   You can calculate the delivery time and the difference between the estimated & actual delivery date using the given formula:
   a. time_to_deliver = order_delivered_customer_date - order_purchase_timestamp
   b. diff_estimated_delivery = order_estimated_delivery_date - order_delivered_customer_date
B. Find out the top 5 states with the highest & lowest average freight value.
C. Find out the top 5 states with the highest & lowest average delivery time.
D. Find out the top 5 states where the order delivery is really fast as compared to the estimated date of delivery.
   You can use the difference between the averages of actual & estimated delivery date to figure out how fast the delivery was for each state.

5a ans)

```
select order_id,datetime_diff(order_delivered_customer_date,order_purchase_timestamp,day) as time_to_deliver,
      datetime_diff(order_estimated_delivery_date,order_delivered_customer_date,day) as diff_estimated_delivery
from `ecommerce-408205.ecommerce.orders`
order by order_id asc
```



5b ans)

```
select distinct state,avg_fprice
from
(
select c.customer_state as state,avg(oi.freight_value) over(partition by c.customer_state) as avg_fprice
from `ecommerce-408205.ecommerce.orders` as o
join `ecommerce-408205.ecommerce.customers` as c
on o.customer_id=c.customer_id
left join `ecommerce-408205.ecommerce.order_items` as oi
on o.order_id=oi.order_id
order by c.customer_state asc
)
order by avg_fprice asc
limit 5
```

state	avg_fprice
SP	15.147275390419187
PR	20.531651567944252
MG	20.630166806306651
RJ	20.960923931682558
DF	21.041354945968411

```
select distinct state,avg_fprice
from
(
select c.customer_state as state,avg(oi.freight_value) over(partition by c.customer_state) as
avg_fprice
from `ecommerce-408205.ecommerce.orders` as o
join `ecommerce-408205.ecommerce.customers` as c
on o.customer_id=c.customer_id
left join `ecommerce-408205.ecommerce.order_items` as oi
on o.order_id=oi.order_id
order by c.customer_state asc
)
order by avg_fprice desc
limit 5
```

state	avg_fprice
RR	42.984423076923079
PB	42.723803986710962
RO	41.069712230215828
AC	40.073369565217391
PI	39.147970479704796

5c ans)

```
select c.customer_state as state,
avg(datetime_diff(order_delivered_customer_date,order_purchase_timestamp,day)) as
avg_delivery_time,
from `ecommerce-408205.ecommerce.orders` o
left join `ecommerce-408205.ecommerce.customers` c
on o.customer_id=c.customer_id
group by c.customer_state
order by avg_delivery_time asc
limit 5
```

```
select c.customer_state as state,
avg(datetime_diff(order_delivered_customer_date,order_purchase_timestamp,day)) as
avg_delivery_time,
from `ecommerce-408205.ecommerce.orders` o
left join `ecommerce-408205.ecommerce.customers` c
on o.customer_id=c.customer_id
group by c.customer_state
order by avg_delivery_time desc
limit 5
```

state	avg_delivery_time
SP	8.2980614890725874
PR	11.526711354864908
MG	11.543813298106569
DF	12.509134615384616
SC	14.479560191711331

state	avg_delivery_time
RR	28.975609756097562
AP	26.731343283582085
AM	25.986206896551728
AL	24.040302267002513
PA	23.316067653276981

5d ans)

```
select c.customer_state as
state,avg(datetime_diff(order_estimated_delivery_date,order_delivered_customer_date,day)
) as avg_delivery_rate
from `ecommerce-408205.ecommerce.orders` o
left join `ecommerce-408205.ecommerce.customers` c
on o.customer_id=c.customer_id
group by c.customer_state
order by avg_delivery_rate asc
limit 5
```

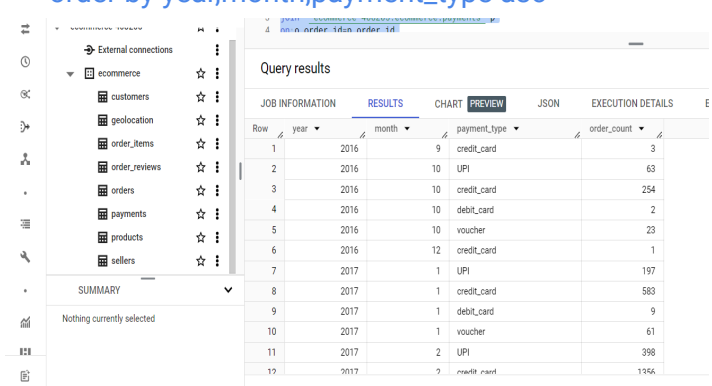
state	avg_delivery_rate
AL	7.9471032745591943
MA	8.76847977684797
SE	9.1731343283582127
ES	9.6185463659147885
BA	9.93488943488941

6.Analysis based on the payments:

A. Find the month on month no. of orders placed using different payment types.
B. Find the no. of orders placed on the basis of the payment installments that have been paid.

6a ans)

```
select extract(year from o.order_purchase_timestamp) as year,extract(Month from
o.order_purchase_timestamp) as month,p.payment_type as payment_type,count(o.order_id) as
order_count
from `ecommerce-408205.ecommerce.orders` o
join  `ecommerce-408205.ecommerce.payments` p
on o.order_id=p.order_id
group by year,month,payment_type
order by year,month,payment_type asc
```



Row	year	month	payment_type	order_count
1	2016	9	credit_card	3
2	2016	10	UPI	63
3	2016	10	credit_card	254
4	2016	10	debit_card	2
5	2016	10	voucher	23
6	2016	12	credit_card	1
7	2017	1	UPI	197
8	2017	1	credit_card	583
9	2017	1	debit_card	9
10	2017	1	voucher	61
11	2017	2	UPI	398
12	2017	2	credit_card	1355

6b ans)

```
select p.payment_installments as payment_installments,count(o.order_id) as order_count
from `ecommerce-408205.ecommerce.orders` o
join  `ecommerce-408205.ecommerce.payments` p
on o.order_id=p.order_id
group by payment_installments
order by payment_installments asc
```