

# Proyek Analisis Data: E-Commerce Public Dataset

- Nama: Farrel Rasyad
- Email: [farrelrasyad.frr@gmail.com](mailto:farrelrasyad.frr@gmail.com) (<mailto:farrelrasyad.frr@gmail.com>)
- Id Dicoding: farrel\_rasyad\_eypa
- github repo: <https://github.com/FrL1902/python-data-analysis-project-dicoding> (<https://github.com/FrL1902/python-data-analysis-project-dicoding>)

## Menentukan Pertanyaan Bisnis

- Apa saja 5 kategori barang terlaris dalam jangka waktu tertentu?
- Apa saja 5 kategori dengan skor review (rata rata) terbagus dan terburuk?

## Import semua library yang dibutuhkan

```
In [1]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import streamlit as st
from babel.numbers import format_currency
sns.set(style='dark')
```

## Data Wrangling

### Gathering Data

Di bagian gathering data, saya load dataset yang didownload dari dicoding

#### Customer

```
In [2]: customers_df = pd.read_csv("data/customers_dataset.csv")
customers_df.head()
```

Out[2]:

	customer_id	customer_unique_id	customer_zip_code_prefix	customer_city	customer_state
0	06b8999e2fba1a1fbc88172c00ba8bc7	861eff4711a542e4b93843c6dd7febb0	14001	sao paulo	S
1	18955e83d337fd6b2def6b18a428ac77	290c77bc529b7ac935b93aa66c333dc3	14002	sao paulo	S
2	4e7b3e00288586ebd08712fdd0374a03	060e732b5b29e8181a18229c7b0b2b5e	14003	sao paulo	S
3	b2b6027bc5c5109e529d4dc6358b12c3	259dac757896d24d7702b9acbbff3f3c	14004	sao paulo	S
4	4f2d8ab171c80ec8364f7c12e35b23ad	345ecd01c38d18a9036ed96c73b8d066	14005	sao paulo	S

## Geolocation

```
In [3]: geolocation_df = pd.read_csv("data/geolocation_dataset.csv")
geolocation_df.head()
```

Out[3]:

	geolocation_zip_code_prefix	geolocation_lat	geolocation_lng	geolocation_city	geolocation_state
0	1037	-23.545621	-46.639292	sao paulo	S
1	1046	-23.546081	-46.644820	sao paulo	S
2	1046	-23.546129	-46.642951	sao paulo	S
3	1041	-23.544392	-46.639499	sao paulo	S
4	1035	-23.541578	-46.641607	sao paulo	S

## Order Items

```
In [4]: order_items_df = pd.read_csv("data/order_items_dataset.csv")
order_items_df.head()
```

Out[4]:

	order_id	order_item_id	product_id
0	00010242fe8c5a6d1ba2dd792cb16214	1	4244733e06e7ecb4970a6e2683c13e61
1	00018f77f2f0320c557190d7a144bdd3	1	e5f2d52b802189ee658865ca93d83a8f
2	000229ec398224ef6ca0657da4fc703e	1	c777355d18b72b67abbeef9df44fd0fd
3	00024acbcdf0a6daa1e931b038114c75	1	7634da152a4610f1595efa32f14722fc
4	00042b26cf59d7ce69dfabb4e55b4fd9	1	ac6c3623068f30de03045865e4e10089

## Order Payments

In [5]: `order_payments_df = pd.read_csv("data/order_payments_dataset.csv")  
order_payments_df.head()`

Out[5]:

	order_id	payment_sequential	payment_type	payment_installments
0	b81ef226f3fe1789b1e8b2acac839d17	1	credit_card	8
1	a9810da82917af2d9aefd1278f1dcfa0	1	credit_card	1
2	25e8ea4e93396b6fa0d3dd708e76c1bd	1	credit_card	1
3	ba78997921bbcdc1373bb41e913ab953	1	credit_card	8
4	42fdf880ba16b47b59251dd489d4441a	1	credit_card	2

## Order Reviews

In [6]: `order_reviews_df = pd.read_csv("data/order_reviews_dataset.csv")  
order_reviews_df.head()`

Out[6]:

	review_id	order_id	review_score	review_c
0	7bc2406110b926393aa56f80a40eba40	73fc7af87114b39712e6da79b0a377eb	4	
1	80e641a11e56f04c1ad469d5645fdfde	a548910a1c6147796b98fdf73dbeba33	5	
2	228ce5500dc1d8e020d8d1322874b6f0	f9e4b658b201a9f2ecdecbb34bed034b	5	
3	e64fb393e7b32834bb789ff8bb30750e	658677c97b385a9be170737859d3511b	5	
4	f7c4243c7fe1938f181bec41a392bdeb	8e6bfb81e283fa7e4f11123a3fb894f1	5	

## Orders

In [7]: `orders_df = pd.read_csv("data/orders_dataset.csv")  
orders_df.head()`

Out[7]:

	order_id	customer_id	order_status	order_pur
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	20
1	53cdb2fc8bc7dce0b6741e2150273451	b0830fb4747a6c6d20dea0b8c802d7ef	delivered	20
2	47770eb9100c2d0c44946d9cf07ec65d	41ce2a54c0b03bf3443c3d931a367089	delivered	20
3	949d5b44dbf5de918fe9c16f97b45f8a	f88197465ea7920adcdbec7375364d82	delivered	20
4	ad21c59c0840e6cb83a9ceb5573f8159	8ab97904e6daea8866dbdbc4fb7aad2c	delivered	20

## Product Category Name Translation

```
In [8]: product_category_name_translation_df = pd.read_csv("data/product_category_name_translation.csv")
product_category_name_translation_df.head()
```

```
Out[8]:   product_category_name  product_category_name_english
```

0	beleza_saude	health_beauty
1	informatica_acessorios	computers_accessories
2	automotivo	auto
3	cama_mesa_banho	bed_bath_table
4	moveis_decoracao	furniture_decor

## Products

```
In [9]: products_df = pd.read_csv("data/products_dataset.csv")
products_df.head()
```

```
Out[9]:   product_id  product_category_name  product_name_lenght  product_des
```

0	1e9e8ef04dbcff4541ed26657ea517e5	perfumaria	40.0
1	3aa071139cb16b67ca9e5dea641aaa2f	artes	44.0
2	96bd76ec8810374ed1b65e291975717f	esporte_lazer	46.0
3	cef67bcfe19066a932b7673e239eb23d	bebés	27.0
4	9dc1a7de274444849c219cff195d0b71	utilidades_domesticas	37.0

## Sellers

```
In [10]: sellers_df = pd.read_csv("data/sellers_dataset.csv")
sellers_df.head()
```

```
Out[10]:   seller_id  seller_zip_code_prefix  seller_city  seller_state
```

0	3442f8959a84dea7ee197c632cb2df15	13023	campinas	SP
1	d1b65fc7debc3361ea86b5f14c68d2e2	13844	mogi guacu	SP
2	ce3ad9de960102d0677a81f5d0bb7b2d	20031	rio de janeiro	RJ
3	c0f3eea2e14555b6faeee3dd58c1b1c3	4195	sao paulo	SP
4	51a04a8a6bdcb23deccc82b0b80742cf	12914	braganca paulista	SP

## Assessing Data

Di bagian assessing data, saya mengecek data seperti:

- dari tipe data yang digunakan apakah sudah sesuai atau tidak,
- apakah ada data yang null?
- apakah ada data yang duplikat?
- apakah ada data yang abnormal dalam dataset?

## Customer

In [11]: `customers_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99441 entries, 0 to 99440
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   customer_id      99441 non-null   object  
 1   customer_unique_id 99441 non-null   object  
 2   customer_zip_code_prefix 99441 non-null   int64  
 3   customer_city     99441 non-null   object  
 4   customer_state    99441 non-null   object  
dtypes: int64(1), object(4)
memory usage: 3.8+ MB
```

In [12]: `customers_df.isna().sum()`

```
customer_id          0
customer_unique_id   0
customer_zip_code_prefix 0
customer_city        0
customer_state       0
dtype: int64
```

In [13]: `print("Duplicates: ", customers_df.duplicated().sum())`

```
Duplicates:  0
```

In [14]: `customers_df.describe()`

```
customer_zip_code_prefix
```

<b>count</b>	99441.000000
<b>mean</b>	35137.474583
<b>std</b>	29797.938996
<b>min</b>	1003.000000
<b>25%</b>	11347.000000
<b>50%</b>	24416.000000
<b>75%</b>	58900.000000
<b>max</b>	99990.000000

Tabel ini berisikan data tamabahn customer, yaotu lokasi customer. Sudah di cek bahwa customer\_zip\_code\_prefix memang ada yang nilainya 99990 di dunia nyata, tidak ada kelainan data yang abnormal. Tidak ada data yang null dan tidak ada data yang duplikat. Tabel Customer sudah bisa digunakan

## Geolocation

In [15]: `geolocation_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1000163 entries, 0 to 1000162
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   geolocation_zip_code_prefix  1000163 non-null   int64  
 1   geolocation_lat            1000163 non-null   float64 
 2   geolocation_lng            1000163 non-null   float64 
 3   geolocation_city           1000163 non-null   object  
 4   geolocation_state          1000163 non-null   object  
dtypes: float64(2), int64(1), object(2)
memory usage: 38.2+ MB
```

In [16]: `geolocation_df.isna().sum()`

```
geolocation_zip_code_prefix    0
geolocation_lat                0
geolocation_lng                0
geolocation_city               0
geolocation_state              0
dtype: int64
```

In [17]: `print("Duplicates: ", geolocation_df.duplicated().sum())`

Duplicates: 261831

In [18]: `geolocation_df.describe()`

	geolocation_zip_code_prefix	geolocation_lat	geolocation_lng
<b>count</b>	1.000163e+06	1.000163e+06	1.000163e+06
<b>mean</b>	3.657417e+04	-2.117615e+01	-4.639054e+01
<b>std</b>	3.054934e+04	5.715866e+00	4.269748e+00
<b>min</b>	1.001000e+03	-3.660537e+01	-1.014668e+02
<b>25%</b>	1.107500e+04	-2.360355e+01	-4.857317e+01
<b>50%</b>	2.653000e+04	-2.291938e+01	-4.663788e+01
<b>75%</b>	6.350400e+04	-1.997962e+01	-4.376771e+01
<b>max</b>	9.999000e+04	4.506593e+01	1.211054e+02

Tidak ada kelainan data yang abnormal. Tidak ada data yang null. Akan tetapi, ada banyak data yang duplikat. Harus di drop terlebih dahulu duplicate data nya

## Order Items

In [19]: `order_items_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112650 entries, 0 to 112649
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         112650 non-null   object  
 1   order_item_id    112650 non-null   int64   
 2   product_id       112650 non-null   object  
 3   seller_id        112650 non-null   object  
 4   shipping_limit_date 112650 non-null   object  
 5   price            112650 non-null   float64 
 6   freight_value    112650 non-null   float64 
dtypes: float64(2), int64(1), object(4)
memory usage: 6.0+ MB
```

In [20]: `order_items_df.isna().sum()`

```
order_id          0
order_item_id     0
product_id        0
seller_id         0
shipping_limit_date 0
price             0
freight_value     0
dtype: int64
```

In [21]: `print("Duplicates: ", order_items_df.duplicated().sum())`

Duplicates: 0

In [22]: `order_items_df.describe()`

	order_item_id	price	freight_value
<b>count</b>	112650.000000	112650.000000	112650.000000
<b>mean</b>	1.197834	120.653739	19.990320
<b>std</b>	0.705124	183.633928	15.806405
<b>min</b>	1.000000	0.850000	0.000000
<b>25%</b>	1.000000	39.900000	13.080000
<b>50%</b>	1.000000	74.990000	16.260000
<b>75%</b>	1.000000	134.900000	21.150000
<b>max</b>	21.000000	6735.000000	409.680000

Untuk tabel order items ini tidak ada data yang duplikat atau null. Untuk price ini lebih bergantung terhadap sellernya ingin menjual dengan harga seberapa tinggi/rendah. Jadi perbedaan value di max dan min yang jauh ini normal. Akan tetapi, untuk kolom shipping\_limit\_date seharusnya menggunakan tipe data datetime. Selain itu, seharusnya data sudah bisa langsung digunakan

## Order Payments

In [23]: `order_payments_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 103886 entries, 0 to 103885
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         103886 non-null   object  
 1   payment_sequential 103886 non-null   int64  
 2   payment_type      103886 non-null   object  
 3   payment_installments 103886 non-null   int64  
 4   payment_value     103886 non-null   float64 
dtypes: float64(1), int64(2), object(2)
memory usage: 4.0+ MB
```

In [24]: `order_payments_df.isna().sum()`

```
Out[24]: order_id          0
payment_sequential  0
payment_type        0
payment_installments 0
payment_value       0
dtype: int64
```

In [25]: `print("Duplicates: ", order_payments_df.duplicated().sum())`

```
Duplicates:  0
```

In [26]: `order_payments_df.describe()`

```
Out[26]:
```

	payment_sequential	payment_installments	payment_value
<b>count</b>	103886.000000	103886.000000	103886.000000
<b>mean</b>	1.092679	2.853349	154.100380
<b>std</b>	0.706584	2.687051	217.494064
<b>min</b>	1.000000	0.000000	0.000000
<b>25%</b>	1.000000	1.000000	56.790000
<b>50%</b>	1.000000	1.000000	100.000000
<b>75%</b>	1.000000	4.000000	171.837500
<b>max</b>	29.000000	24.000000	13664.080000

Di tabel Order Payments ini seharusnya sudah bisa digunakan karena tidak ada data yang null dan duplicate.

## Order Reviews

In [27]: `order_reviews_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99224 entries, 0 to 99223
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
0   review_id        99224 non-null   object  
1   order_id         99224 non-null   object  
2   review_score     99224 non-null   int64  
3   review_comment_title 11568 non-null   object  
4   review_comment_message 40977 non-null   object  
5   review_creation_date 99224 non-null   object  
6   review_answer_timestamp 99224 non-null   object  
dtypes: int64(1), object(6)
memory usage: 5.3+ MB
```

In [28]: `order_reviews_df.isna().sum()`

```
review_id          0
order_id          0
review_score      0
review_comment_title 87656
review_comment_message 58247
review_creation_date 0
review_answer_timestamp 0
dtype: int64
```

In [29]: `print("Duplicates: ", order_reviews_df.duplicated().sum())`

```
Duplicates: 0
```

In [30]: `order_reviews_df.describe()`

```
review_score
count    99224.000000
mean      4.086421
std       1.347579
min       1.000000
25%      4.000000
50%      5.000000
75%      5.000000
max      5.000000
```

Di tabel ini ada lumayan banyak kolom yang null, tetapi sebenarnya kolom tersebut tidak berkaitan dengan data pertanyaan bisnis. Lalu, sebenarnya untuk review, memang banyak orang yang hanya menilai dengan memberikan beberapa bintang saja. Banyak orang yang tidak mengkomen/review karena memang customer tidak terlalu peduli. Ada juga kesalahan di tipe data. Seharusnya kolom `review_answer_timestamp` dan `review_creation_date` menggunakan

datetime. Sebenarnya Kolom ini tidak digunakan sama sekali karena tidak akan digunakan dalam proses menjawab pertanyaan bisnis yang saya ajukan. Jadi kemungkinan besar data dari

## Orders

In [31]: `orders_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99441 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         99441 non-null   object  
 1   customer_id      99441 non-null   object  
 2   order_status     99441 non-null   object  
 3   order_purchase_timestamp 99441 non-null   object  
 4   order_approved_at 99281 non-null   object  
 5   order_delivered_carrier_date 97658 non-null   object  
 6   order_delivered_customer_date 96476 non-null   object  
 7   order_estimated_delivery_date 99441 non-null   object  
dtypes: object(8)
memory usage: 6.1+ MB
```

In [32]: `orders_df.isna().sum()`

```
order_id          0
customer_id       0
order_status       0
order_purchase_timestamp 0
order_approved_at 160
order_delivered_carrier_date 1783
order_delivered_customer_date 2965
order_estimated_delivery_date 0
dtype: int64
```

In [33]: `print("Duplicates: ", orders_df.duplicated().sum())`

Duplicates: 0

In [34]: `orders_df.describe()`

	order_id	customer_id	order_status	order
<b>count</b>	99441	99441	99441	99441
<b>unique</b>	99441	99441	99441	8
<b>top</b>	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	
<b>freq</b>	1	1	1	96478

Untuk tabel ini, lumayan banyak data yang null, semua data kolom waktu juga menggunakan tipe data yang bukan Datetime

## Product Category Name Translation

```
In [35]: product_category_name_translation_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 71 entries, 0 to 70
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   product_category_name    71 non-null   object  
 1   product_category_name_english 71 non-null   object  
dtypes: object(2)
memory usage: 1.2+ KB
```

```
In [36]: product_category_name_translation_df.isna().sum()
```

```
Out[36]: product_category_name      0
product_category_name_english     0
dtype: int64
```

```
In [37]: print("Duplicates: ", product_category_name_translation_df.duplicated().sum())
```

```
Duplicates:  0
```

```
In [38]: product_category_name_translation_df.describe()
```

	product_category_name	product_category_name_english
count	71	71
unique	71	71
top	beleza_saude	health_beauty
freq	1	1

Untuk tabel ini tidak ada yang aneh, duplikat, null. Karena tabel ini hanya tabel untuk translasi data saja, atau seperti master table, karena tidak ada yang duplikat/null, tabel ini sudah bisa digunakan

## Products

In [39]: `products_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 32951 entries, 0 to 32950
Data columns (total 9 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   product_id       32951 non-null   object  
 1   product_category_name 32341 non-null   object  
 2   product_name_lenght    32341 non-null   float64 
 3   product_description_lenght 32341 non-null   float64 
 4   product_photos_qty     32341 non-null   float64 
 5   product_weight_g       32949 non-null   float64 
 6   product_length_cm      32949 non-null   float64 
 7   product_height_cm      32949 non-null   float64 
 8   product_width_cm       32949 non-null   float64 
dtypes: float64(7), object(2)
memory usage: 2.3+ MB
```

In [40]: `products_df.isna().sum()`

```
Out[40]: product_id          0
product_category_name  610
product_name_lenght    610
product_description_lenght  610
product_photos_qty     610
product_weight_g        2
product_length_cm       2
product_height_cm       2
product_width_cm        2
dtype: int64
```

In [41]: `print("Duplicates: ", products_df.duplicated().sum())`

Duplicates: 0

In [42]: `products_df.describe()`

```
Out[42]:   product_name_lenght  product_description_lenght  product_photos_qty  product_weight_g  r
count          32341.000000            32341.000000            32341.000000            32949.000000
mean          48.476949             771.495285             2.188986            2276.472488
std           10.245741            635.115225             1.736766            4282.038731
min           5.000000             4.000000             1.000000             0.000000
25%          42.000000            339.000000             1.000000            300.000000
50%          51.000000            595.000000             1.000000            700.000000
75%          57.000000            972.000000             3.000000            1900.000000
max          76.000000            3992.000000            20.000000            40425.000000
```

Untuk tabel ini karena berisi tentang informasi tambahan suatu produk. Kecuali saya membutuhkan suatu informasi spesifik ke suatu produk, tabel ini tidak terlalu berguna. Tabel ini juga memiliki null values di semua kolom kecuali product\_id

## Sellers

In [43]: `sellers_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3095 entries, 0 to 3094
Data columns (total 4 columns):
 #   Column           Non-Null Count  Dtype  
 ---  --  
 0   seller_id        3095 non-null   object  
 1   seller_zip_code_prefix  3095 non-null   int64  
 2   seller_city       3095 non-null   object  
 3   seller_state      3095 non-null   object  
dtypes: int64(1), object(3)
memory usage: 96.8+ KB
```

In [44]: `sellers_df.isna().sum()`

```
Out[44]: seller_id          0
seller_zip_code_prefix  0
seller_city            0
seller_state           0
dtype: int64
```

In [45]: `print("Duplicates: ", sellers_df.duplicated().sum())`

Duplicates: 0

In [46]: `sellers_df.describe()`

```
Out[46]: seller_zip_code_prefix
```

	seller_zip_code_prefix
<b>count</b>	3095.000000
<b>mean</b>	32291.059451
<b>std</b>	32713.453830
<b>min</b>	1001.000000
<b>25%</b>	7093.500000
<b>50%</b>	14940.000000
<b>75%</b>	64552.500000
<b>max</b>	99730.000000

tabel ini hanya berisikan informasi tambahan seller yaitu lokasinya. Tidak ada data yang null dan duplikat. Akan tetapi, kecuali saya menginginkan suatu informasi spesifik ke suatu seller, data dari tabel ini tidak berguna

Berikut adalah chart hasil proses Assessing Data

	Tipe Data	Missing Value	Duplicate Data	Inaccurate value
<b>Customer</b>	-	-	-	-
<b>Geolocation</b>	-	-	261831	-
<b>Order Items</b>	Shipping_limit_date harusnya jadi datetime	-	-	-
<b>Order Payments</b>	-	-	-	-
<b>Order Reviews</b>	Review_creation_date, review_answer_timestamp harusnya pake datetime	di kolom review_comment_title, review_comment_message	-	-
<b>Orders</b>	Order_purchase_timestamp, Order_approved_at, order_delivered_carrier_date, Order_delivered_customer_date, Order_estimated_delivery_date Semua diatas harus pake datetime	di kolom order_approved_at, order_delivered_carrier_date, order_delivered_customer_date	-	-
<b>Product Category Name Translation</b>	-	-	-	-
<b>Products</b>	-	Semuanya ada missing values kecuali di product_id	-	-
<b>Sellers</b>	-	-	-	-

## Cleaning Data

### Geolocation

```
In [47]: print("Duplicates: ", geolocation_df.duplicated().sum())
```

Duplicates: 261831

```
In [48]: geolocation_df.drop_duplicates(inplace=True)
```

```
In [49]: print("Duplicates: ", geolocation_df.duplicated().sum())
```

Duplicates: 0

Duplicate data di tabel geolocation\_df sudah hilang dan tabel sudah bisa digunakan

### Order Items

```
In [50]: order_items_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112650 entries, 0 to 112649
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         112650 non-null   object  
 1   order_item_id    112650 non-null   int64   
 2   product_id       112650 non-null   object  
 3   seller_id        112650 non-null   object  
 4   shipping_limit_date 112650 non-null   object  
 5   price            112650 non-null   float64 
 6   freight_value    112650 non-null   float64 
dtypes: float64(2), int64(1), object(4)
memory usage: 6.0+ MB
```

```
In [51]: datetime_columns = ["shipping_limit_date"]
```

```
for column in datetime_columns:
    order_items_df[column] = pd.to_datetime(order_items_df[column])
```

```
In [52]: order_items_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112650 entries, 0 to 112649
Data columns (total 7 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         112650 non-null   object  
 1   order_item_id    112650 non-null   int64   
 2   product_id       112650 non-null   object  
 3   seller_id        112650 non-null   object  
 4   shipping_limit_date 112650 non-null   datetime64[ns]
 5   price            112650 non-null   float64 
 6   freight_value    112650 non-null   float64 
dtypes: datetime64[ns](1), float64(2), int64(1), object(3)
memory usage: 6.0+ MB
```

kolom `shipping_limit_date` sudah terubah menjadi tipe data `datetime`. Tabel sudah bisa digunakan

## Order Reviews

In [53]: `order_reviews_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99224 entries, 0 to 99223
Data columns (total 7 columns):
 #   Column           Non-Null Count Dtype  
 ---  -----           -----          ----- 
 0   review_id        99224 non-null  object  
 1   order_id         99224 non-null  object  
 2   review_score     99224 non-null  int64   
 3   review_comment_title 11568 non-null  object  
 4   review_comment_message 40977 non-null  object  
 5   review_creation_date 99224 non-null  object  
 6   review_answer_timestamp 99224 non-null  object  
dtypes: int64(1), object(6)
memory usage: 5.3+ MB
```

untuk tabel Order Reviews, saya hanya akan menggunakan bagian pentingnya saja. untuk review, sebenarnya review\_score itu sudah cukup dalam mengolah data. Untuk review\_comment\_title dan review\_comment\_message bisa diwakili oleh review\_score

In [54]: `# drop kolom data yang tidak digunakan`

```
order_reviews_df = order_reviews_df.drop(['review_comment_title', 'review_commer
```

In [55]: `# Mengubah kolom "review_creation_date" dan "review_answer_timestamp" ke tipe data datetime`

```
datetime_columns = ['review_creation_date', 'review_answer_timestamp']

for column in datetime_columns:
    order_reviews_df[column] = pd.to_datetime(order_reviews_df[column])
```

In [56]: `order_reviews_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99224 entries, 0 to 99223
Data columns (total 5 columns):
 #   Column           Non-Null Count Dtype  
 ---  -----           -----          ----- 
 0   review_id        99224 non-null  object  
 1   order_id         99224 non-null  object  
 2   review_score     99224 non-null  int64   
 3   review_creation_date 99224 non-null  datetime64[ns]
 4   review_answer_timestamp 99224 non-null  datetime64[ns]
dtypes: datetime64[ns](2), int64(1), object(2)
memory usage: 3.8+ MB
```

Tabel order reviews sudah bisa digunakan

## Orders

In [57]: `orders_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99441 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   order_id         99441 non-null   object  
 1   customer_id      99441 non-null   object  
 2   order_status      99441 non-null   object  
 3   order_purchase_timestamp  99441 non-null   object  
 4   order_approved_at 99281 non-null   object  
 5   order_delivered_carrier_date 97658 non-null   object  
 6   order_delivered_customer_date 96476 non-null   object  
 7   order_estimated_delivery_date 99441 non-null   object  
dtypes: object(8)
memory usage: 6.1+ MB
```

In [58]: *# Mengubah kolom banyak kolom yang memiliki tanggal ke tipe data datetime*

```
datetime_columns = ['order_purchase_timestamp',
                    'order_approved_at',
                    'order_delivered_carrier_date',
                    'order_delivered_customer_date',
                    'order_estimated_delivery_date']

for column in datetime_columns:
    orders_df[column] = pd.to_datetime(orders_df[column])
```

In [59]: `orders_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99441 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype    
---  --  
 0   order_id         99441 non-null   object  
 1   customer_id      99441 non-null   object  
 2   order_status      99441 non-null   object  
 3   order_purchase_timestamp  99441 non-null   datetime64[ns] 
 4   order_approved_at 99281 non-null   datetime64[ns] 
 5   order_delivered_carrier_date 97658 non-null   datetime64[ns] 
 6   order_delivered_customer_date 96476 non-null   datetime64[ns] 
 7   order_estimated_delivery_date 99441 non-null   datetime64[ns] 
dtypes: datetime64[ns](5), object(3)
memory usage: 6.1+ MB
```

In [60]: `orders_df.head(5)`

Out[60]:

	order_id	customer_id	order_status	order_pur
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	20
1	53cdb2fc8bc7dce0b6741e2150273451	b0830fb4747a6c6d20dea0b8c802d7ef	delivered	20
2	47770eb9100c2d0c44946d9cf07ec65d	41ce2a54c0b03bf3443c3d931a367089	delivered	20
3	949d5b44dbf5de918fe9c16f97b45f8a	f88197465ea7920adcdbec7375364d82	delivered	20
4	ad21c59c0840e6cb83a9ceb5573f8159	8ab97904e6daea8866dbdbc4fb7aad2c	delivered	20

◀ ▶

In [61]: `# karena saya ingin mengolah data berdasarkan 2 pertanyaan diatas,  
# berarti saya harus mempunyai informasi semua barang yang berhasil dijual  
# berarti saya hanya membutuhkan data order yang statusnya "delivered" di kolom  
orders_df = orders_df[orders_df['order_status'] == 'delivered']`

In [62]: `orders_df.order_status.value_counts()`

Out[62]: `delivered 96478  
Name: order_status, dtype: int64`

In [63]: `orders_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 96478 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         96478 non-null   object  
 1   customer_id      96478 non-null   object  
 2   order_status      96478 non-null   object  
 3   order_purchase_timestamp  96478 non-null   datetime64[ns]
 4   order_approved_at 96464 non-null   datetime64[ns]
 5   order_delivered_carrier_date 96476 non-null   datetime64[ns]
 6   order_delivered_customer_date 96470 non-null   datetime64[ns]
 7   order_estimated_delivery_date 96478 non-null   datetime64[ns]
dtypes: datetime64[ns](5), object(3)
memory usage: 6.6+ MB
```

```
In [64]: orders_df.isna().sum()
```

```
Out[64]: order_id          0  
customer_id        0  
order_status        0  
order_purchase_timestamp    0  
order_approved_at     14  
order_delivered_carrier_date 2  
order_delivered_customer_date 8  
order_estimated_delivery_date 0  
dtype: int64
```

karena masih ada yang null, tetapi data yang null tersebut sedikit, saya drop data tersebut

```
In [65]: orders_df = orders_df.dropna()
```

```
In [66]: orders_df.isna().sum()
```

```
Out[66]: order_id          0  
customer_id        0  
order_status        0  
order_purchase_timestamp    0  
order_approved_at     0  
order_delivered_carrier_date 0  
order_delivered_customer_date 0  
order_estimated_delivery_date 0  
dtype: int64
```

In [67]: `orders_df.sort_values(by='order_delivered_customer_date', ascending=False)`

Out[67]:

		order_id	customer_id	order_status	order_delivered_customer_date
18731	7e708aed151d6a8601ce8f2eaa712bf4	033fab69968b0d69099d64423831a236		delivered	2023-01-01 00:00:00
56635	450cb96c63e1e5b49d34f223f67976d2	27ae7c8a8fc20ce80d96f01b6f19961b		delivered	2023-01-01 00:00:00
92319	b2997e1d7061605e9285496c581d1fb	9e83d47684eb1a58b1c31830f5de10ac		delivered	2023-01-01 00:00:00
43810	a2b4be96b53022618030c17ed437604d	ffa87b4246c4848711afb512bd51f161		delivered	2023-01-01 00:00:00
21098	7d09831e67caa193da82cfea3bee7aa5	1409b2945191b7aff1975ba2ce9918c5		delivered	2023-01-01 00:00:00
...	...	...	...	...	...
699	ac2b7c522d811acba0aa270ed3e112e4	ef21aebbb093a6db29ccc6aa0b89c347		delivered	2023-01-01 00:00:00
52382	92b44b87f1f7670b8911c5f0e642435e	e561a3f61440b031d3be286a696d06eb		delivered	2023-01-01 00:00:00
56143	d1eb8e4e276a4eea13a5c462c0765e60	9031f9dcde5860b34e6c65ac5c796d30		delivered	2023-01-01 00:00:00
1384	7033745709b7cf1bac7d2533663592de	7f0ca17bb33b230b47459437cf0682c7		delivered	2023-01-01 00:00:00
59102	36989eb07a0de2d3d3129eea35553875	aadd27185177fc7ac9b364898ac09343		delivered	2023-01-01 00:00:00

96455 rows × 8 columns



untuk tabel orders seharusnya sudah bisa digunakan

## Products

In [68]: `products_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 32951 entries, 0 to 32950
Data columns (total 9 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   product_id       32951 non-null   object  
 1   product_category_name  32341 non-null   object  
 2   product_name_length  32341 non-null   float64 
 3   product_description_length  32341 non-null   float64 
 4   product_photos_qty    32341 non-null   float64 
 5   product_weight_g     32949 non-null   float64 
 6   product_length_cm    32949 non-null   float64 
 7   product_height_cm    32949 non-null   float64 
 8   product_width_cm     32949 non-null   float64 
dtypes: float64(7), object(2)
memory usage: 2.3+ MB
```

```
In [69]: products_df.isna().sum()
```

```
Out[69]: product_id          0
product_category_name    610
product_name_lenght      610
product_description_lenght 610
product_photos_qty        610
product_weight_g           2
product_length_cm          2
product_height_cm          2
product_width_cm          2
dtype: int64
```

table ini tidak terlalu berguna untuk menjawab pertanyaan diatas. jadi akan saya drop semua data null sebagai proses cleaning

```
In [70]: products_df = products_df.dropna()
```

```
In [71]: products_df.isna().sum()
```

```
Out[71]: product_id          0
product_category_name    0
product_name_lenght      0
product_description_lenght 0
product_photos_qty        0
product_weight_g           0
product_length_cm          0
product_height_cm          0
product_width_cm          0
dtype: int64
```

```
In [72]: products_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 32340 entries, 0 to 32950
Data columns (total 9 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   product_id       32340 non-null   object 
 1   product_category_name 32340 non-null   object 
 2   product_name_lenght 32340 non-null   float64
 3   product_description_lenght 32340 non-null   float64
 4   product_photos_qty   32340 non-null   float64
 5   product_weight_g     32340 non-null   float64
 6   product_length_cm    32340 non-null   float64
 7   product_height_cm    32340 non-null   float64
 8   product_width_cm    32340 non-null   float64
dtypes: float64(7), object(2)
memory usage: 2.5+ MB
```

# Exploratory Data Analysis (EDA)

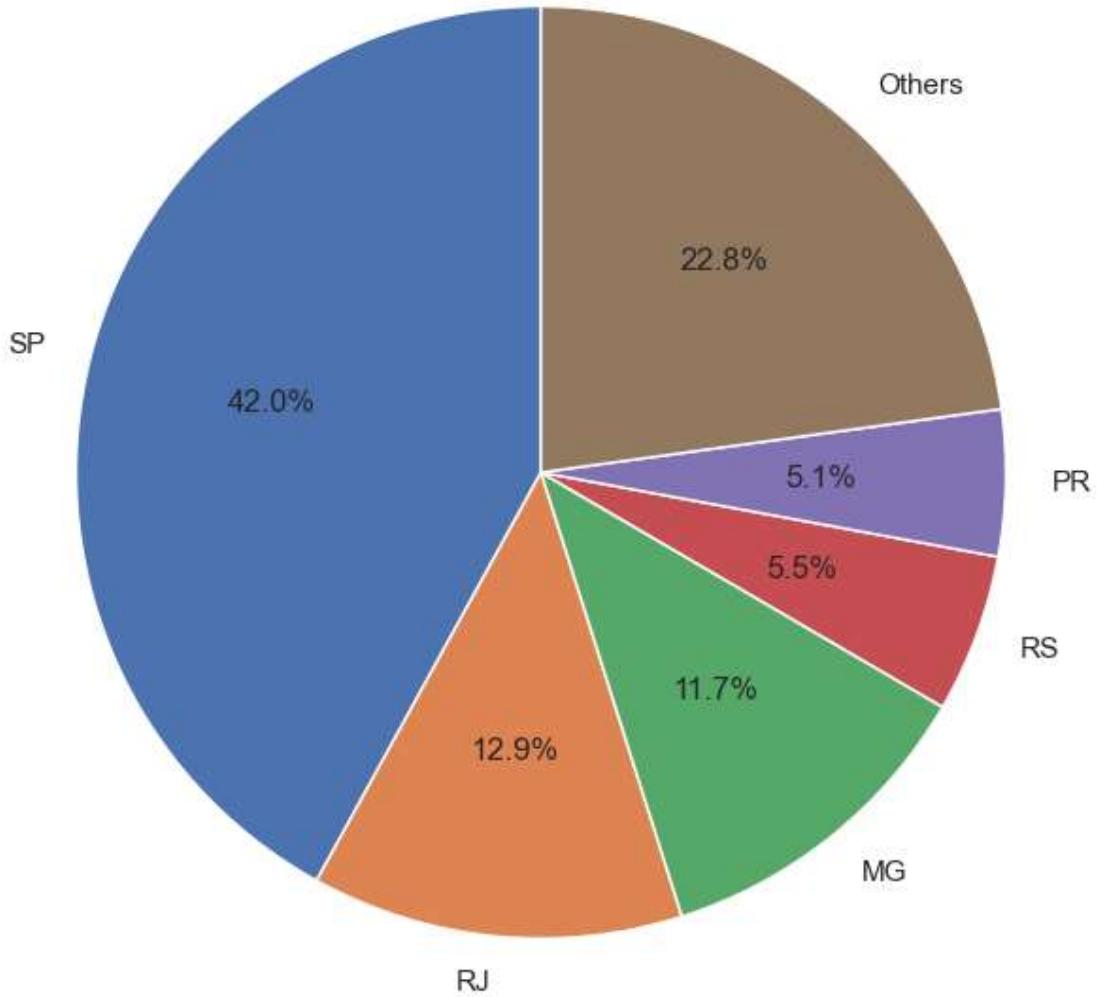
## Customer

```
In [73]: customer_state_counts = customers_df['customer_state'].value_counts()

top_cities = customer_state_counts.head(5)
top_cities['Others'] = customer_state_counts.iloc[5:].sum()

plt.figure(figsize=(8, 8))
plt.pie(top_cities, labels=top_cities.index, autopct='%1.1f%%', startangle=90)
plt.title('Distribution of states with the most customers')
plt.show()
```

Distribution of states with the most customers



Dari pie chart ini kita bisa tahu bahwa customer paling banyak berasal dari state dengan inisial SP

```
In [74]: customers_df.customer_state.value_counts()
```

```
Out[74]: SP      41746
          RJ      12852
          MG      11635
          RS      5466
          PR      5045
          SC      3637
          BA      3380
          DF      2140
          ES      2033
          GO      2020
          PE      1652
          CE      1336
          PA      975
          MT      907
          MA      747
          MS      715
          PB      536
          PI      495
          RN      485
          AL      413
          SE      350
          TO      280
          RO      253
          AM      148
          AC      81
          AP      68
          RR      46
Name: customer_state, dtype: int64
```

Bisa dilihat dari sini bahwa sebagian besar customer yang terdaftar berasal dari state yang berinisial SP

### Customers dan Orders

Karena jumlah customernya banyak sekali, melebihi jumlah ordernya bahkan, berarti ada banyak customer yang hanya terdaftar saja di database dan tidak/belum melakukan pembelian sama sekali. Seberapa banyak tapi?

```
In [75]: customer_id_in_orders_df = orders_df.customer_id.tolist()
customers_df["status"] = customers_df["customer_id"].apply(lambda x: "Active" if x in customer_id_in_orders_df else "Inactive")
customers_df.sample(5)
```

Out[75]:

	customer_id	customer_unique_id	customer_zip_code
13660	79b516ac255abbf7531ea1ea5b43d0db	f710c6901968ec0a8bed20d789690102	
94858	fcf28aeffa802b47732e096c083cbf83	298c3e1a698283a45f1c94df3942bb3b	
44810	faa5236e556d27003bb3e013a8d72795	f00830589ddadb1494fea0c98f165fc	
29114	76d89e16f546f92eae4259a7a4340c6b	d1308d535439be93a45a7f8e5703420d	
75140	fa56d5dbed23c641e19a12b6d7392833	3532616d4171dc2202de2ae9233bb0c5	

```
In [76]: customers_df.groupby(by="status").customer_id.count()
```

Out[76]:

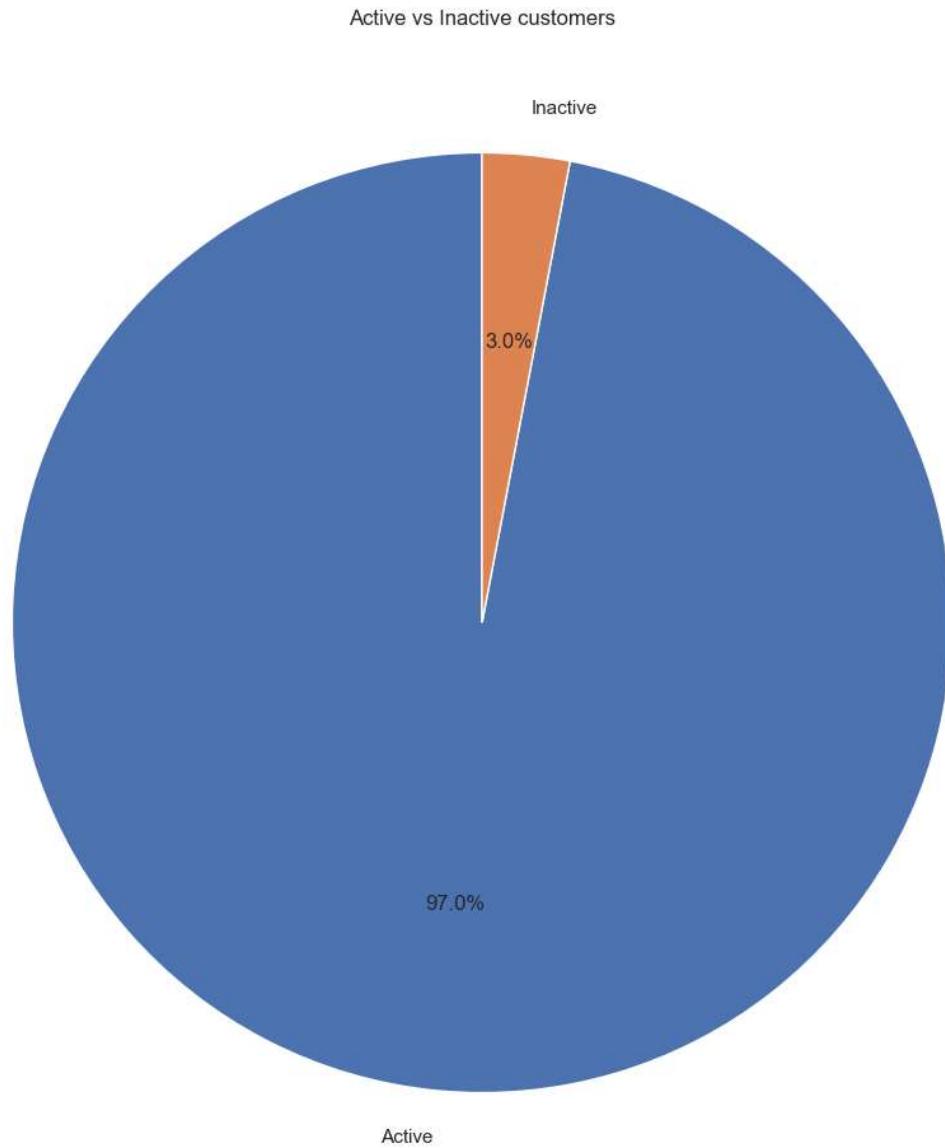
status	customer_id
Active	96455
Inactive	2986

Name: customer\_id, dtype: int64

benar, berarti ada lumayan banyak customer yang terdaftar, tetapi tidak melakukan transaksi

```
In [77]: customers_active = customers_df.groupby(by="status").customer_id.count()

plt.figure(figsize=(12, 12))
plt.pie(customers_active, labels=customers_active.index, autopct='%.1f%%', startangle=90)
plt.title('Active vs Inactive customers')
plt.show()
```



Dari pie chart ini kita bisa melihat bahwa memang banyak sekali customer yang terdaftar dan aktif(97%) dibandingkan customer yang terdaftar tetapi tidak aktif. Maksud dari aktif disini adalah pernah membeli suatu barang. dan

In [78]: `orders_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 96455 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   order_id         96455 non-null   object  
 1   customer_id      96455 non-null   object  
 2   order_status     96455 non-null   object  
 3   order_purchase_timestamp  96455 non-null   datetime64[ns] 
 4   order_approved_at 96455 non-null   datetime64[ns] 
 5   order_delivered_carrier_date 96455 non-null   datetime64[ns] 
 6   order_delivered_customer_date 96455 non-null   datetime64[ns] 
 7   order_estimated_delivery_date 96455 non-null   datetime64[ns] 
dtypes: datetime64[ns](5), object(3)
memory usage: 6.6+ MB
```

In [79]: `orders_df.customer_id.value_counts()`

```
Out[79]: 9ef432eb6251297304e76186b10a928d    1
          110b79f06a0f49a38da99084706a382d    1
          c840e43d3d57dbb4e99374570f2488cd    1
          96c6a3143d7cc33bbebf14ab6abed0ce    1
          eb4350b67a0264c67e5e06a038e4afbb    1
          ..
          7db5bde0f0fce8817a4c317cf05429a    1
          0b8520e0d24d4e14482e01e73e5740c0    1
          a33988fde632872a5c5458823b9c2d01    1
          42f104a41e8e13c7aaaa9d8e11e7c7f5    1
          edb027a75a1449115f6b43211ae02a24    1
Name: customer_id, Length: 96455, dtype: int64
```

ok dari hasil `value_counts` `customer_id` di tabel `orders_df` saya menemukan bahwa setelah setiap customer yang active hanya melakukan transaksi maksimal sekali

### Orders dengan Payment (liat metode bayar paling populer)

```
In [80]: orders_payment_df = pd.merge(
    left=orders_df,
    right=order_payments_df,
    how="left",
    left_on="order_id",
    right_on="order_id"
)
orders_payment_df.head()
```

Out[80]:

	order_id	customer_id	order_status	order_pur
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	20
1	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	20
2	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	20
3	53cdb2fc8bc7dce0b6741e2150273451	b0830fb4747a6c6d20dea0b8c802d7ef	delivered	20
4	47770eb9100c2d0c44946d9cf07ec65d	41ce2a54c0b03bf3443c3d931a367089	delivered	20

In [81]: orders\_df.info()

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 96455 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         96455 non-null   object 
 1   customer_id      96455 non-null   object 
 2   order_status      96455 non-null   object 
 3   order_purchase_timestamp  96455 non-null   datetime64[ns]
 4   order_approved_at  96455 non-null   datetime64[ns]
 5   order_delivered_carrier_date  96455 non-null   datetime64[ns]
 6   order_delivered_customer_date  96455 non-null   datetime64[ns]
 7   order_estimated_delivery_date  96455 non-null   datetime64[ns]
dtypes: datetime64[ns](5), object(3)
memory usage: 6.6+ MB
```

In [82]: orders\_payment\_df.order\_id.value\_counts()

Out[82]:

ccf804e764ed5650cd8759557269dc13	26
285c2e15beb4ac83635ccc563dc71f4	22
895ab968e7bb0d5659d16cd74cd1650c	21
ee9ca989fc93ba09a6eddc250ce01742	19
fedcd9f7ccdc8cba3a18defedd1a5547	19
..	
bd9e8d4cec0e721d5ffebe153035eeeea	1
0866001f9f2ff47df177b77ce6abecd4	1
baaed1de8d45224736f9660579d8cc97	1
df111b726761108ddc8bd410a4d54b09	1
66dea50a8b16d9b4dee7af250b4be1a5	1

Name: order\_id, Length: 96455, dtype: int64

```
In [83]: print("Duplicate Data: ", orders_payment_df.order_id.duplicated().sum())
```

```
Duplicate Data: 4279
```

```
In [84]: orders_payment_df = orders_payment_df.drop_duplicates(subset='order_id', keep='
```

```
In [85]: orders_payment_df.drop_duplicates(inplace=True)
```

```
In [86]: orders_payment_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 96455 entries, 0 to 100733
Data columns (total 12 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   order_id         96455 non-null   object 
 1   customer_id      96455 non-null   object 
 2   order_status      96455 non-null   object 
 3   order_purchase_timestamp 96455 non-null   datetime64[ns]
 4   order_approved_at 96455 non-null   datetime64[ns]
 5   order_delivered_carrier_date 96455 non-null   datetime64[ns]
 6   order_delivered_customer_date 96455 non-null   datetime64[ns]
 7   order_estimated_delivery_date 96455 non-null   datetime64[ns]
 8   payment_sequential 96454 non-null   float64 
 9   payment_type       96454 non-null   object  
 10  payment_installments 96454 non-null   float64 
 11  payment_value      96454 non-null   float64 
dtypes: datetime64[ns](5), float64(3), object(4)
memory usage: 9.6+ MB
```

OK. yang saya baru lakukan adalah join tabel orders\_df dan order\_payments\_df. Tujuannya adalah untuk mencari tahu metode pembayaran yang paling populer dipakai oleh customer. Akan tetapi, ada masalah yaitu beberapa order\_idnya menjadi terulang, karena itu saya buang data order id yang duplikat. Sekarang saya bisa mencari tahu metode pembayaran paling populer dan memvisualisasikannya dengan pie chart

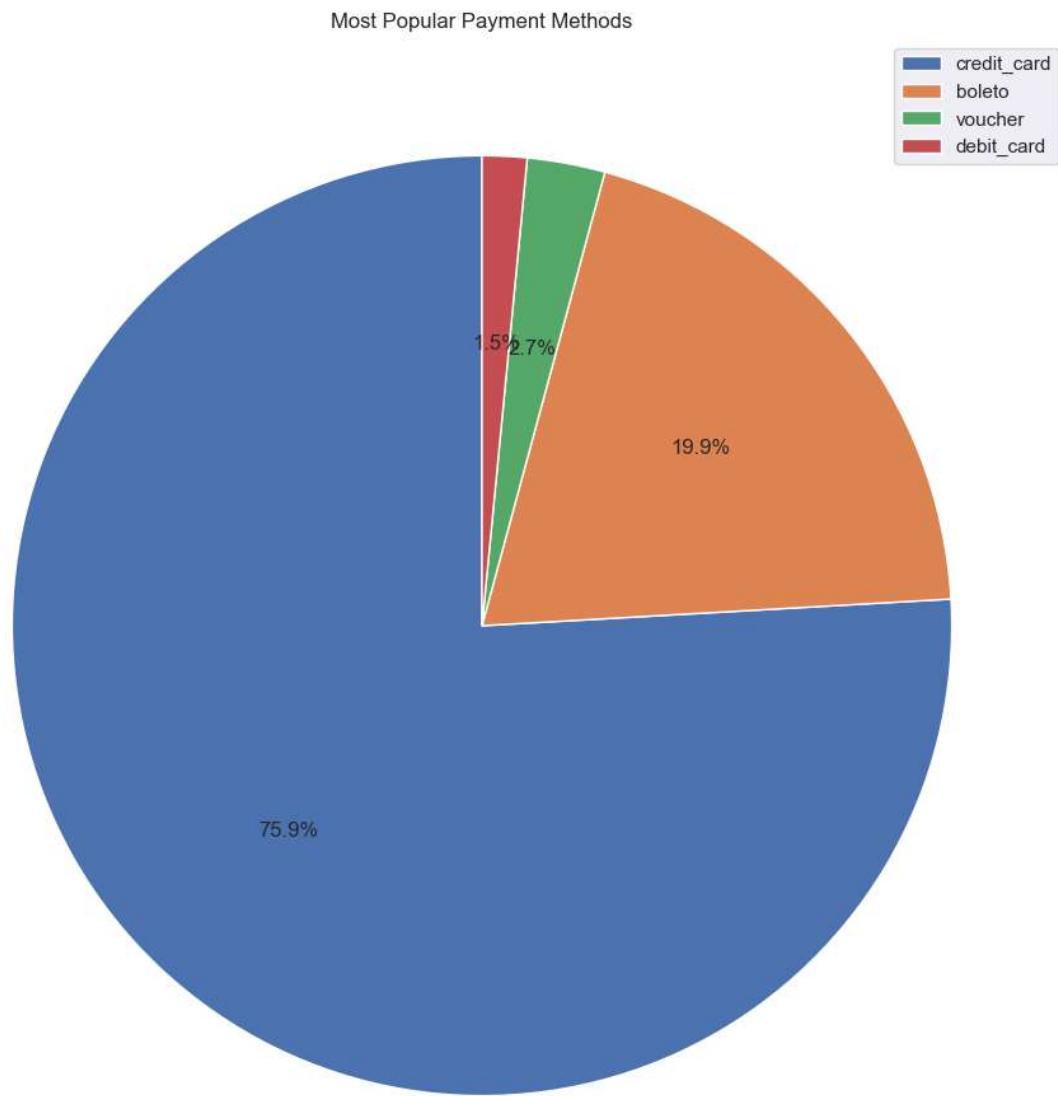
```
In [87]: orders_payment_df['payment_type'].value_counts()
```

```
Out[87]: credit_card    73212
boleto        19177
voucher        2582
debit_card     1483
Name: payment_type, dtype: int64
```

```
In [88]: payment_methods = orders_payment_df['payment_type'].value_counts()

payment_methods = payment_methods.head(4)

plt.figure(figsize=(12, 12))
plt.pie(payment_methods, autopct='%1.1f%%', startangle=90)
plt.legend(payment_methods.index, loc="best")
plt.title('Most Popular Payment Methods')
plt.show()
```



Jadi, berdasarkan piechart tersebut, lebih dari 75% transaksi sukses memakai metode pembayaran "credit\_card". Kedua adalah "boleto", Boleto sendiri adalah salah satu tipe pembayaran yang bisa ditemui di Brazil dan berbentuk semacam invoice. Bisa dilihat disini <https://en.wikipedia.org/wiki/Boleto> (<https://en.wikipedia.org/wiki/Boleto>). Tipe pembayaran Voucher dan Debit ternyata kurang populer

### Orders dengan Order\_Reviews (liat rating paling banyak)

Jadi, saya ingin tahu frekuensi tiap skor yang muncul untuk tiap barang di tabel orders

In [89]: `orders_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 96455 entries, 0 to 99440
Data columns (total 8 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         96455 non-null   object  
 1   customer_id      96455 non-null   object  
 2   order_status     96455 non-null   object  
 3   order_purchase_timestamp  96455 non-null   datetime64[ns]
 4   order_approved_at 96455 non-null   datetime64[ns]
 5   order_delivered_carrier_date 96455 non-null   datetime64[ns]
 6   order_delivered_customer_date 96455 non-null   datetime64[ns]
 7   order_estimated_delivery_date 96455 non-null   datetime64[ns]
dtypes: datetime64[ns](5), object(3)
memory usage: 6.6+ MB
```

In [90]: `order_reviews_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 99224 entries, 0 to 99223
Data columns (total 5 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   review_id        99224 non-null   object  
 1   order_id         99224 non-null   object  
 2   review_score     99224 non-null   int64  
 3   review_creation_date 99224 non-null   datetime64[ns]
 4   review_answer_timestamp 99224 non-null   datetime64[ns]
dtypes: datetime64[ns](2), int64(1), object(2)
memory usage: 3.8+ MB
```

```
In [91]: orders_ratings_df = pd.merge(
    left=orders_df,
    right=order_reviews_df,
    how="left",
    left_on="order_id",
    right_on="order_id"
)
orders_ratings_df.head()
```

Out[91]:

	order_id	customer_id	order_status	order_pur
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	20
1	53cdb2fc8bc7dce0b6741e2150273451	b0830fb4747a6c6d20dea0b8c802d7ef	delivered	20
2	47770eb9100c2d0c44946d9cf07ec65d	41ce2a54c0b03bf3443c3d931a367089	delivered	20
3	949d5b44dbf5de918fe9c16f97b45f8a	f88197465ea7920adcdbec7375364d82	delivered	20
4	ad21c59c0840e6cb83a9ceb5573f8159	8ab97904e6daea8866dbdbc4fb7aad2c	delivered	20

In [92]: orders\_ratings\_df.info()

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 96984 entries, 0 to 96983
Data columns (total 12 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         96984 non-null   object 
 1   customer_id      96984 non-null   object 
 2   order_status      96984 non-null   object 
 3   order_purchase_timestamp  96984 non-null   datetime64[ns]
 4   order_approved_at 96984 non-null   datetime64[ns]
 5   order_delivered_carrier_date  96984 non-null   datetime64[ns]
 6   order_delivered_customer_date 96984 non-null   datetime64[ns]
 7   order_estimated_delivery_date 96984 non-null   datetime64[ns]
 8   review_id         96338 non-null   object 
 9   review_score       96338 non-null   float64
 10  review_creation_date 96338 non-null   datetime64[ns]
 11  review_answer_timestamp 96338 non-null   datetime64[ns]
dtypes: datetime64[ns](7), float64(1), object(4)
memory usage: 9.6+ MB
```

In [93]: orders\_ratings\_df = orders\_ratings\_df.drop\_duplicates(subset='order\_id', keep='first')

In [94]: print("Duplicate Data: ", orders\_ratings\_df.order\_id.duplicated().sum())

Duplicate Data: 0

In [95]: orders\_ratings\_df = orders\_ratings\_df.dropna()

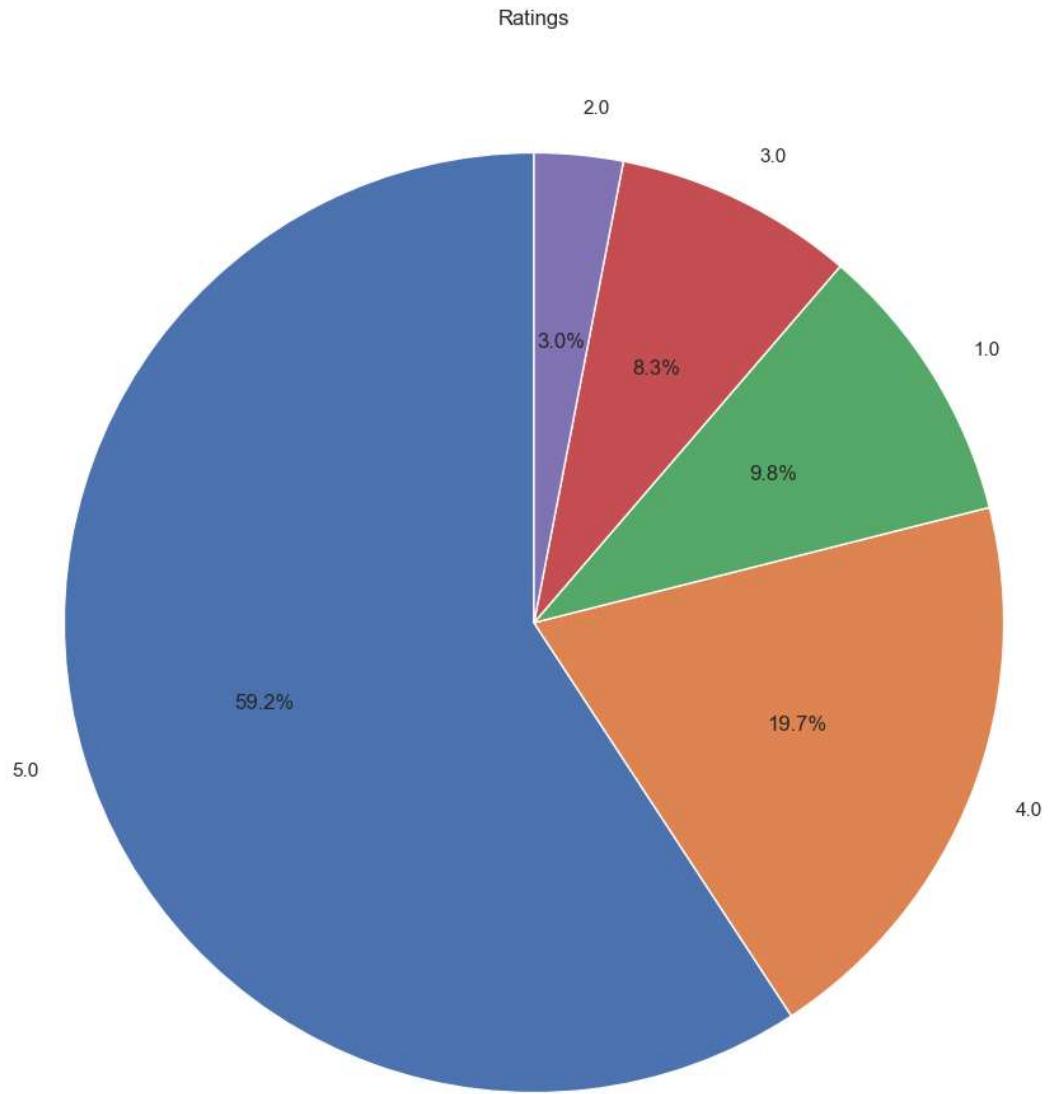
```
In [96]: orders_ratings_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 95809 entries, 0 to 96983
Data columns (total 12 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         95809 non-null   object  
 1   customer_id      95809 non-null   object  
 2   order_status      95809 non-null   object  
 3   order_purchase_timestamp  95809 non-null   datetime64[ns]
 4   order_approved_at 95809 non-null   datetime64[ns]
 5   order_delivered_carrier_date 95809 non-null   datetime64[ns]
 6   order_delivered_customer_date 95809 non-null   datetime64[ns]
 7   order_estimated_delivery_date 95809 non-null   datetime64[ns]
 8   review_id         95809 non-null   object  
 9   review_score       95809 non-null   float64 
 10  review_creation_date 95809 non-null   datetime64[ns]
 11  review_answer_timestamp 95809 non-null   datetime64[ns]
dtypes: datetime64[ns](7), float64(1), object(4)
memory usage: 9.5+ MB
```

sekarang kedua data dari tabel orders dan order\_reviews sudah di left join. Sebenarnya bisa saja langsung melihat value counts dari tabel order\_reviews\_df. tetapi saya ingin agar datanya lebih akurat, yaitu data yang sukses terkirim saja

```
In [97]: scores = orders_ratings_df['review_score'].value_counts()

plt.figure(figsize=(12, 12))
plt.pie(scores, labels=scores.index, autopct='%1.1f%%', startangle=90)
plt.title('Ratings')
plt.show()
```



Dari piechart diatas, saya mengetahui bahwa banyak customer sebagian besar sangat puas dengan barang yang diterimanya dengan memberikan skor review 5 atau 4. Ada banyak customer yang memberikan skor 1. Customer jarang memberikan skor 3 dan 2

## Seller

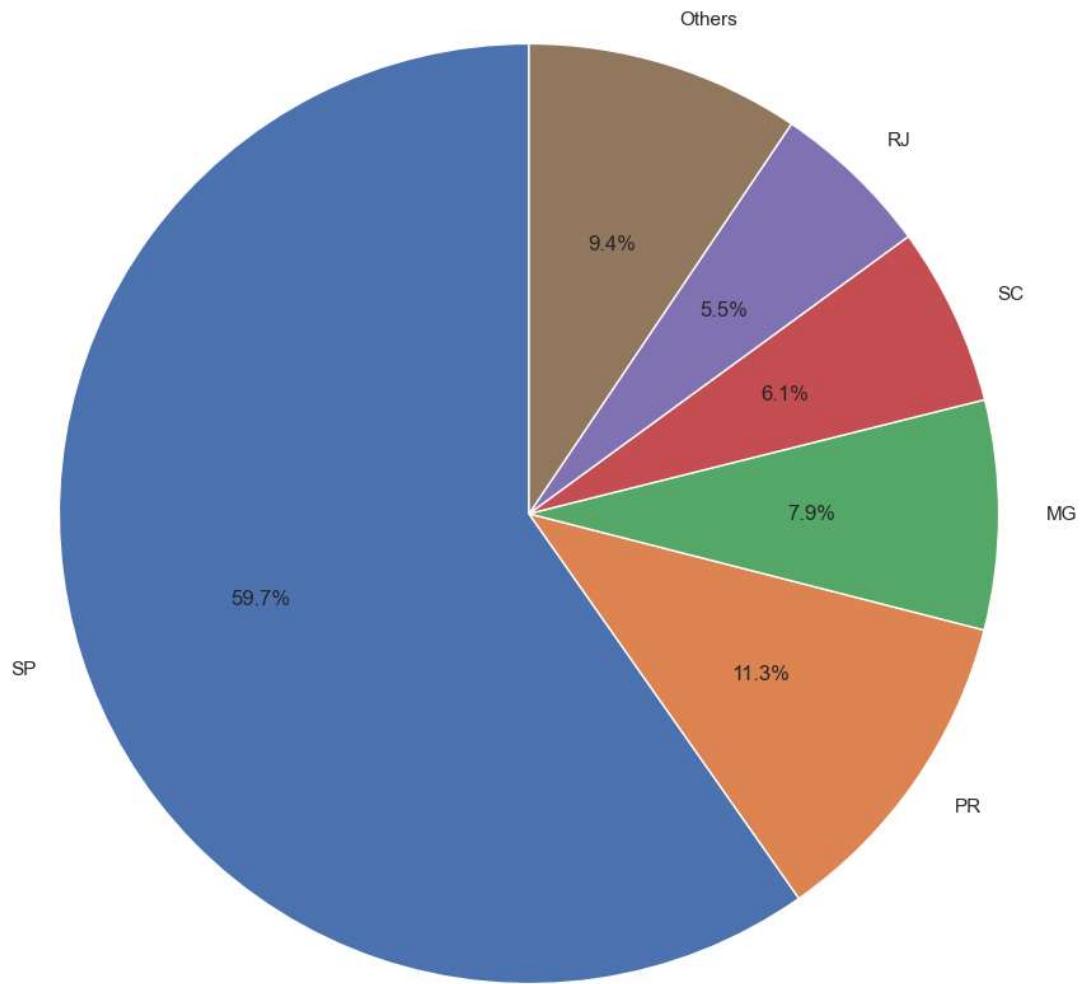
Saya ingin tahu 5 lokasi dengan seller terbanyak

```
In [98]: sellerr_state_counts = sellers_df['seller_state'].value_counts()

top_cities = sellerr_state_counts.head(5)
top_cities['Others'] = sellerr_state_counts.iloc[5:].sum()

plt.figure(figsize=(12, 12))
plt.pie(top_cities, labels=top_cities.index, autopct='%1.1f%%', startangle=90)
plt.title('Distribution of states with the most sellers')
plt.show()
```

Distribution of states with the most sellers



Jadi seperti customer, lokasi seller banyak terletak di state berinisial SP

## Visualization & Explanatory Analysis

Interval data yang akan dipakai untuk menjawab pertanyaan adalah data tahun 2017 karena tahun 2017 ada lengkap dari bulan Januari hingga Desember

```
In [99]: most_recent_date = orders_df['order_purchase_timestamp'].max()

oldest_date = orders_df['order_purchase_timestamp'].min()

print('most_recent_date: ' + str(most_recent_date))
print('oldest_date: ' + str(oldest_date))

most_recent_date: 2018-08-29 15:00:37
oldest_date: 2016-09-15 12:16:38
```

```
In [100]: orders_ratings_df_2017 = orders_ratings_df[orders_ratings_df['order_purchase_t
```

```
In [101]: orders_ratings_df_2017.info()
```

#	Column	Non-Null Count	Dtype
0	order_id	43083	non-null object
1	customer_id	43083	non-null object
2	order_status	43083	non-null object
3	order_purchase_timestamp	43083	non-null datetime64[ns]
4	order_approved_at	43083	non-null datetime64[ns]
5	order_delivered_carrier_date	43083	non-null datetime64[ns]
6	order_delivered_customer_date	43083	non-null datetime64[ns]
7	order_estimated_delivery_date	43083	non-null datetime64[ns]
8	review_id	43083	non-null object
9	review_score	43083	non-null float64
10	review_creation_date	43083	non-null datetime64[ns]
11	review_answer_timestamp	43083	non-null datetime64[ns]

dtypes: datetime64[ns](7), float64(1), object(4)  
memory usage: 4.3+ MB

```
In [102]: most_recent_date = orders_ratings_df_2017['order_purchase_timestamp'].max()
```

```
oldest_date = orders_ratings_df_2017['order_purchase_timestamp'].min()
```

```
print('most_recent_date: ' + str(most_recent_date))
print('oldest_date: ' + str(oldest_date))
```

```
most_recent_date: 2017-12-31 23:29:31
```

```
oldest_date: 2017-01-05 11:56:06
```

```
In [103]: order_items_for_processing=order_items_df
```

```
In [104]: order_items_for_processing = order_items_for_processing.drop(['order_item_id'],
```

```
In [105]: order_items_for_processing = order_items_for_processing.drop(['price'], axis=1)
```

```
In [106]: order_items_for_processing = order_items_for_processing.drop(['freight_value'],
```

```
In [107]: order_items_for_processing = order_items_for_processing.drop(['shipping_limit_c
```

```
In [108]: order_items_for_processing.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 112650 entries, 0 to 112649
Data columns (total 3 columns):
 #   Column      Non-Null Count  Dtype  
---  --  
 0   order_id    112650 non-null  object 
 1   product_id  112650 non-null  object 
 2   seller_id   112650 non-null  object 
dtypes: object(3)
memory usage: 2.6+ MB
```

```
In [109]: order_items_for_processing.drop_duplicates(inplace=True)
```

```
In [110]: order_items_for_processing.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 102425 entries, 0 to 112649
Data columns (total 3 columns):
 #   Column      Non-Null Count  Dtype  
---  --  
 0   order_id    102425 non-null  object 
 1   product_id  102425 non-null  object 
 2   seller_id   102425 non-null  object 
dtypes: object(3)
memory usage: 3.1+ MB
```

```
In [111]: part_df = pd.merge(orders_ratings_df_2017, order_items_for_processing, on='orde
```

```
In [112]: part_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 44773 entries, 0 to 44772
Data columns (total 14 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   order_id         44773 non-null   object  
 1   customer_id     44773 non-null   object  
 2   order_status     44773 non-null   object  
 3   order_purchase_timestamp  44773 non-null   datetime64[ns] 
 4   order_approved_at 44773 non-null   datetime64[ns] 
 5   order_delivered_carrier_date 44773 non-null   datetime64[ns] 
 6   order_delivered_customer_date 44773 non-null   datetime64[ns] 
 7   order_estimated_delivery_date 44773 non-null   datetime64[ns] 
 8   review_id        44773 non-null   object  
 9   review_score      44773 non-null   float64 
 10  review_creation_date 44773 non-null   datetime64[ns] 
 11  review_answer_timestamp 44773 non-null   datetime64[ns] 
 12  product_id       44773 non-null   object  
 13  seller_id        44773 non-null   object  
dtypes: datetime64[ns](7), float64(1), object(6)
memory usage: 5.1+ MB
```

```
In [113]: print("Duplicates: ", part_df.order_id.duplicated().sum())
```

```
Duplicates: 1690
```

```
In [114]: part_df = part_df.drop_duplicates(subset='order_id', keep='first')
```

```
In [115]: print("Duplicates: ", part_df.order_id.duplicated().sum())
```

```
Duplicates: 0
```

In [116]: `part_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 43083 entries, 0 to 44772
Data columns (total 14 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         43083 non-null   object  
 1   customer_id      43083 non-null   object  
 2   order_status      43083 non-null   object  
 3   order_purchase_timestamp  43083 non-null   datetime64[ns]
 4   order_approved_at 43083 non-null   datetime64[ns]
 5   order_delivered_carrier_date 43083 non-null   datetime64[ns]
 6   order_delivered_customer_date 43083 non-null   datetime64[ns]
 7   order_estimated_delivery_date 43083 non-null   datetime64[ns]
 8   review_id         43083 non-null   object  
 9   review_score       43083 non-null   float64 
 10  review_creation_date 43083 non-null   datetime64[ns]
 11  review_answer_timestamp 43083 non-null   datetime64[ns]
 12  product_id        43083 non-null   object  
 13  seller_id         43083 non-null   object  
dtypes: datetime64[ns](7), float64(1), object(6)
memory usage: 4.9+ MB
```

In [117]: `part_df.head()`

Out[117]:

	order_id	customer_id	order_status	order_pu
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	2
1	949d5b44dbf5de918fe9c16f97b45f8a	f88197465ea7920adcdbec7375364d82	delivered	2
2	a4591c265e18cb1dcee52889e2d8acc3	503740e9ca751ccdda7ba28e9ab8f608	delivered	2
3	6514b8ad8028c9f2cc2374ded245783f	9bdf08b4b3b52b5526ff42d37d47f222	delivered	2
4	76c6e866289321a7c93b82b54852dc33	f54a9f0e6b351c431402b8461ea51999	delivered	2



In [118]: `final_df = pd.merge(part_df, order_payments_df, on='order_id')`

```
In [119]: final_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 45367 entries, 0 to 45366
Data columns (total 18 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         45367 non-null   object  
 1   customer_id      45367 non-null   object  
 2   order_status     45367 non-null   object  
 3   order_purchase_timestamp  45367 non-null   datetime64[ns]
 4   order_approved_at 45367 non-null   datetime64[ns]
 5   order_delivered_carrier_date 45367 non-null   datetime64[ns]
 6   order_delivered_customer_date 45367 non-null   datetime64[ns]
 7   order_estimated_delivery_date 45367 non-null   datetime64[ns]
 8   review_id        45367 non-null   object  
 9   review_score      45367 non-null   float64 
 10  review_creation_date 45367 non-null   datetime64[ns]
 11  review_answer_timestamp 45367 non-null   datetime64[ns]
 12  product_id       45367 non-null   object  
 13  seller_id        45367 non-null   object  
 14  payment_sequential 45367 non-null   int64   
 15  payment_type      45367 non-null   object  
 16  payment_installments 45367 non-null   int64   
 17  payment_value      45367 non-null   float64 
dtypes: datetime64[ns](7), float64(2), int64(2), object(7)
memory usage: 6.6+ MB
```

```
In [120]: final_df = final_df.drop_duplicates(subset='order_id', keep='first')
```

In [121]: `final_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 43083 entries, 0 to 45366
Data columns (total 18 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   order_id         43083 non-null   object  
 1   customer_id      43083 non-null   object  
 2   order_status      43083 non-null   object  
 3   order_purchase_timestamp  43083 non-null   datetime64[ns]
 4   order_approved_at 43083 non-null   datetime64[ns]
 5   order_delivered_carrier_date 43083 non-null   datetime64[ns]
 6   order_delivered_customer_date 43083 non-null   datetime64[ns]
 7   order_estimated_delivery_date 43083 non-null   datetime64[ns]
 8   review_id         43083 non-null   object  
 9   review_score       43083 non-null   float64 
 10  review_creation_date 43083 non-null   datetime64[ns]
 11  review_answer_timestamp 43083 non-null   datetime64[ns]
 12  product_id        43083 non-null   object  
 13  seller_id         43083 non-null   object  
 14  payment_sequential 43083 non-null   int64   
 15  payment_type       43083 non-null   object  
 16  payment_installments 43083 non-null   int64   
 17  payment_value       43083 non-null   float64 
dtypes: datetime64[ns](7), float64(2), int64(2), object(7)
memory usage: 6.2+ MB
```

In [122]: `final_df.head()`

	order_id	customer_id	order_status	order_pu
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	2
3	949d5b44dbf5de918fe9c16f97b45f8a	f88197465ea7920adcdbec7375364d82	delivered	2
4	a4591c265e18cb1dcee52889e2d8acc3	503740e9ca751ccdda7ba28e9ab8f608	delivered	2
5	6514b8ad8028c9f2cc2374ded245783f	9bdf08b4b3b52b5526ff42d37d47f222	delivered	2
6	76c6e866289321a7c93b82b54852dc33	f54a9f0e6b351c431402b8461ea51999	delivered	2

Penjelasan. Saya menggabungkan `order_items_df`, `order_reviews_df`, `orders_df`, `order_payments_df` agar bisa mendapatkan data utuhnya. Mengapa saya memilih `orders_df` sebagai tabel/dataframe utama? karena `orders_df` merupakan data paling unik dari semuanya. Mengapa saya tidak memilih `order_items_df`? ternyata `order_id` di dataframe tersebut tidak unik. Jadinya ada data seperti pembelian barang yang sama sebanyak 21 kali. Lebih mudah jika saya mencari dataframe yang unik, baru menggabungkan total semua pembeliannya dari tabel `order_payments_df`. Dengan ini, seharusnya data di `final_df` ini sudah cukup untuk menjawab pertanyaan yang ada.

## Pertanyaan 1:

Apa saja 5 kategori barang terlaris di tahun 2017?

Cara saya untuk mendapatkan jawaban ini adalah pertama untuk menyambungkan dataframe products dengan product\_category\_name\_translation saya pertama memilih products karena di tabel ini memiliki product\_id yang nanti bisa disambungkan ke final\_df lalu saya memilih product\_category\_name\_translation untuk translasi data ini dari bahasa spanyol ke inggris

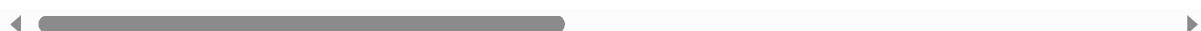
In [123]: `product_category_name_translation_df.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 71 entries, 0 to 70
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   product_category_name    71 non-null   object 
 1   product_category_name_english 71 non-null   object 
dtypes: object(2)
memory usage: 1.2+ KB
```

In [124]: `products_df.head()`

Out[124]:

	product_id	product_category_name	product_name_lenght	product_des
0	1e9e8ef04dbcff4541ed26657ea517e5	perfumaria	40.0	
1	3aa071139cb16b67ca9e5dea641aaa2f	artes	44.0	
2	96bd76ec8810374ed1b65e291975717f	esporte_lazer	46.0	
3	cef67bcfe19066a932b7673e239eb23d	bebés	27.0	
4	9dc1a7de274444849c219cff195d0b71	utilidades_domesticas	37.0	



In [125]: `product_id_names = products_df.iloc[:, :2]`

In [126]: `product_id_names.head()`

Out[126]:

	product_id	product_category_name
0	1e9e8ef04dbcff4541ed26657ea517e5	perfumaria
1	3aa071139cb16b67ca9e5dea641aaa2f	artes
2	96bd76ec8810374ed1b65e291975717f	esporte_lazer
3	cef67bcfe19066a932b7673e239eb23d	bebés
4	9dc1a7de274444849c219cff195d0b71	utilidades_domesticas

In [127]: `print("Duplicates: ", product_id_names.product_id.duplicated().sum())`

Duplicates: 0

In [128]: `product_id_names.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 32340 entries, 0 to 32950
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   product_id      32340 non-null   object  
 1   product_category_name  32340 non-null   object  
dtypes: object(2)
memory usage: 758.0+ KB
```

In [129]: `product_id_names.product_category_name.value_counts()`

```
Out[129]: cama_mesa_banho          3029
esporte_lazer                   2867
moveis_decoracao                2657
beleza_saude                     2444
utilidades_domesticas            2335
...
fashion_roupa_infanto_juvenil    5
casa_conforto_2                  5
pc_gamer                          3
seguros_e_servicos                2
cds_dvds_musicais                 1
Name: product_category_name, Length: 73, dtype: int64
```

In [130]: `product_translation = pd.merge(
 left=product_id_names,
 right=product_category_name_translation_df,
 how="left",
 left_on="product_category_name",
 right_on="product_category_name"
)
product_translation.head()`

```
Out[130]:      product_id  product_category_name  product_category_name_english
 0   1e9e8ef04dbcff4541ed26657ea517e5        perfumaria                    perfumery
 1   3aa071139cb16b67ca9e5dea641aaa2f        artes                         art
 2   96bd76ec8810374ed1b65e291975717f        esporte_lazer                sports_leisure
 3   cef67bcfe19066a932b7673e239eb23d        bebes                         baby
 4   9dc1a7de274444849c219cff195d0b71        utilidades_domesticas        housewares
```

```
In [131]: product_translation.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 32340 entries, 0 to 32339
Data columns (total 3 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   product_id       32340 non-null   object  
 1   product_category_name  32340 non-null   object  
 2   product_category_name_english 32327 non-null   object  
dtypes: object(3)
memory usage: 1010.6+ KB
```

```
In [132]: product_translation = product_translation.dropna()
```

```
In [133]: product_translation.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 32327 entries, 0 to 32339
Data columns (total 3 columns):
 #   Column           Non-Null Count  Dtype  
---  --  
 0   product_id       32327 non-null   object  
 1   product_category_name  32327 non-null   object  
 2   product_category_name_english 32327 non-null   object  
dtypes: object(3)
memory usage: 1010.2+ KB
```

```
In [134]: final_df = pd.merge(
    left=final_df,
    right=product_translation,
    how="left",
    left_on="product_id",
    right_on="product_id"
)
final_df.head()
```

```
Out[134]:
```

	order_id	customer_id	order_status	order_pu
0	e481f51cbdc54678b7cc49136f2d6af7	9ef432eb6251297304e76186b10a928d	delivered	2
1	949d5b44dbf5de918fe9c16f97b45f8a	f88197465ea7920adcdbec7375364d82	delivered	2
2	a4591c265e18cb1dcee52889e2d8acc3	503740e9ca751ccdda7ba28e9ab8f608	delivered	2
3	6514b8ad8028c9f2cc2374ded245783f	9bdf08b4b3b52b5526ff42d37d47f222	delivered	2
4	76c6e866289321a7c93b82b54852dc33	f54a9f0e6b351c431402b8461ea51999	delivered	2



```
In [135]: final_df = final_df.dropna()
```

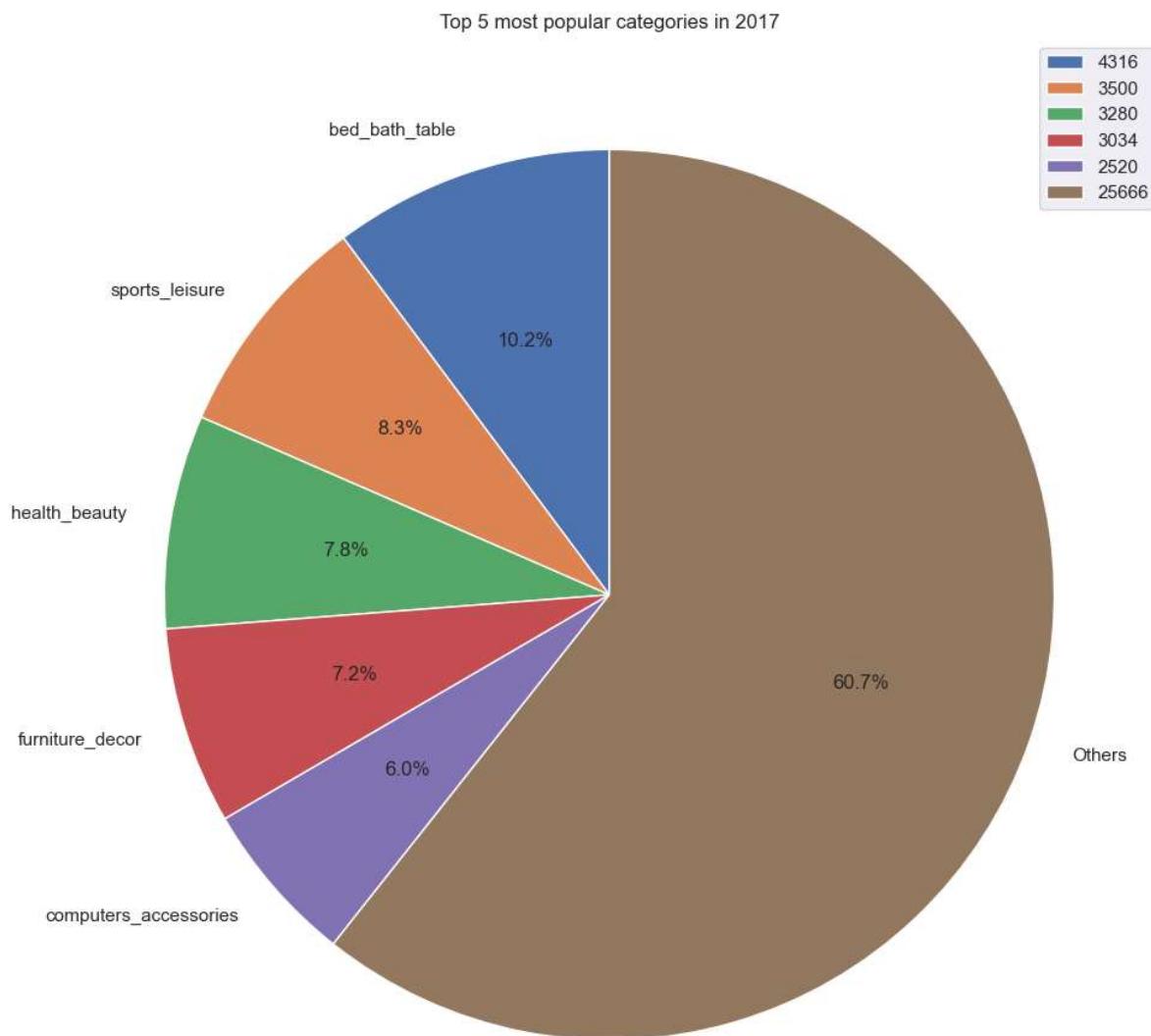
```
In [136]: # final_df.to_csv('all_df.csv')
```

```
In [137]: popular_categories = final_df
```

```
In [138]: popular_categories = final_df['product_category_name_english'].value_counts()

top_categories = popular_categories.head(5)
top_categories['Others'] = popular_categories.iloc[5:].sum()

plt.figure(figsize=(12, 12))
plt.pie(top_categories, labels=top_categories.index, autopct='%1.1f%%', startangle=90)
plt.title('Top 5 most popular categories in 2017')
plt.legend(top_categories, loc="best")
plt.show()
```



In [139]: `top_categories.head()`

Out[139]:

product_category_name_english	Count
bed_bath_table	4316
sports_leisure	3500
health_beauty	3280
furniture_decor	3034
computers_accessories	2520

Name: product\_category\_name\_english, dtype: int64

Berdasarkan data yang sudah diolah dan ditampilkan oleh piechart diatas, kita bisa menyimpulkan bahwa kategori paling populer di tahun 2017 adalah kategori bed\_bath\_table. 4 kategori populer lainnya secara berurutan adalah sports\_leisure, health\_beauty, furniture\_decor, computers\_accessories

### Apa saja 5 kategori dengan skor review (rata rata) terbagus dan terburuk?

Cara saya menjawab ini adalah dengan menggunakan final\_df yang sudah dipakai di pertanyaan nomor 1, lalu saya potong bagian nama kategori dan skornya, saya baru lalu akan hitung rata ratanya

In [140]:

```
category_score = final_df[['review_score', 'product_category_name_english']]
category_score.head()
```

Out[140]:

	review_score	product_category_name_english
0	4.0	housewares
1	5.0	pet_shop
2	4.0	auto
3	5.0	auto
4	1.0	furniture_decor

In [141]: `category_score.info()`

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 42316 entries, 0 to 43082
Data columns (total 2 columns):
 #   Column           Non-Null Count  Dtype  
--- 
 0   review_score      42316 non-null   float64
 1   product_category_name_english 42316 non-null   object 
dtypes: float64(1), object(1)
memory usage: 991.8+ KB
```

```
In [142]: category_score.describe()
```

```
Out[142]: review_score
```

	review_score
count	42316.000000
mean	4.177096
std	1.254582
min	1.000000
25%	4.000000
50%	5.000000
75%	5.000000
max	5.000000

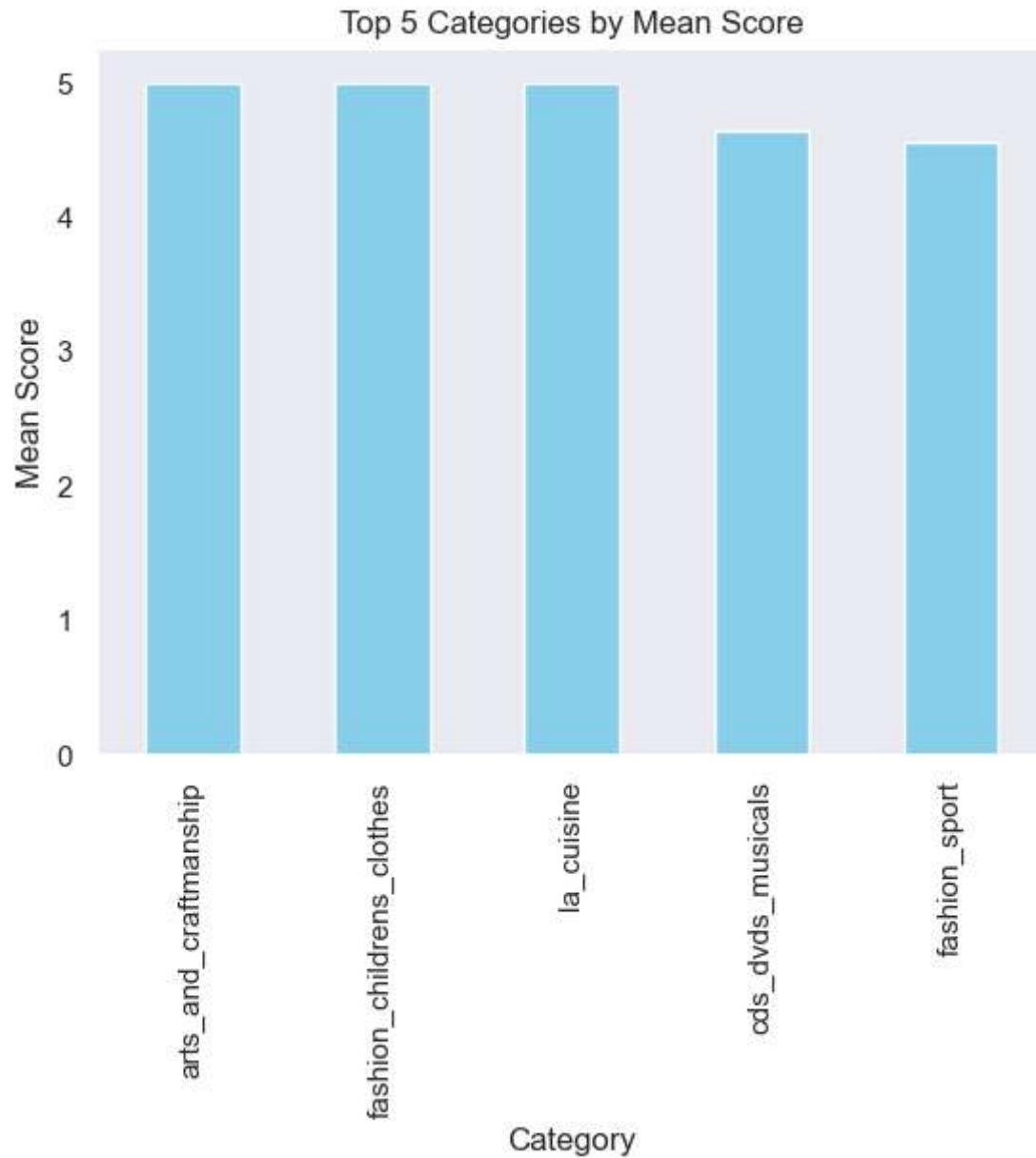
```
In [143]: mean_category_scores = category_score.groupby(by="product_category_name_english"
    "review_score": "mean",
}).sort_values(by="review_score", ascending=False)
```

```
In [144]: df = pd.DataFrame(mean_category_scores)

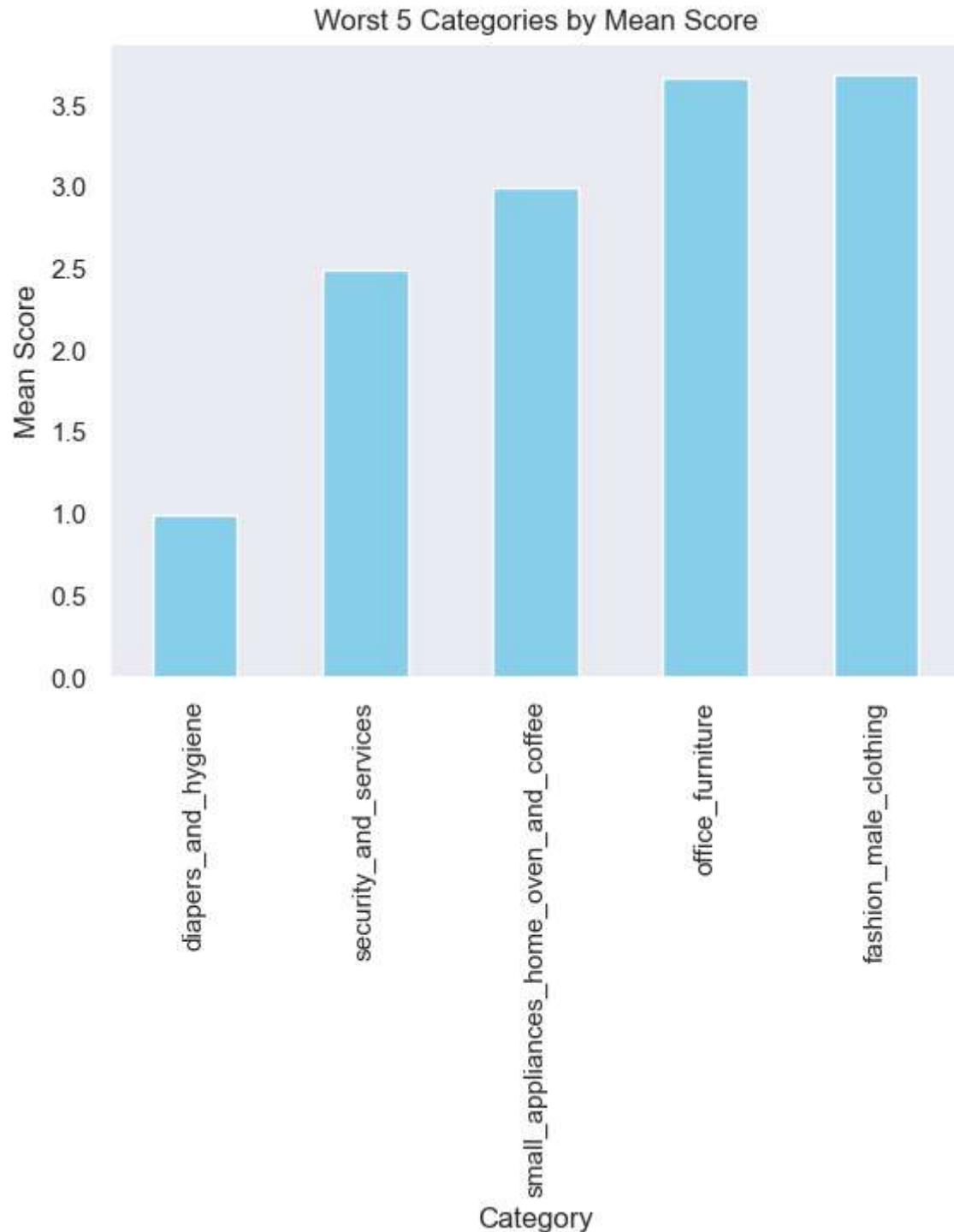
# Calculate the mean of each category
category_means = df.groupby('product_category_name_english')['review_score'].mean()

# Get the top 10 categories based on mean score
top_5_categories = category_means.nlargest(5)
bad_5_categories = category_means.nsmallest(5)

# Plotting a bar chart for best score
top_5_categories.plot(kind='bar', color='skyblue')
plt.title('Top 5 Categories by Mean Score')
plt.xlabel('Category')
plt.ylabel('Mean Score')
plt.show()
```



```
In [145]: # Plotting a bar chart for best score  
bad_5_categories.plot(kind='bar', color='skyblue')  
plt.title('Worst 5 Categories by Mean Score')  
plt.xlabel('Category')  
plt.ylabel('Mean Score')  
plt.show()
```



Berdasarkan bar chart diatas, ternyata ada 3 kategori yang memiliki nilai tertinggi yang sama. yaitu arts and craftsmanship, fashion childrens clothes, dan la cuisine. Untuk kategori dengan skor terburuk, jatuh kepada diapers and hygiene.

## Conclusion

- Pertanyaan 1. Apa saja 5 kategori barang terlaris di tahun 2017? Berdasarkan data yang sudah diolah dan ditampilkan di piechart diatas, kita bisa menyimpulkan bahwa kategori paling populer di tahun 2017 adalah kategori bed\_bath\_table. 4 kategori populer lainnya secara berurutan adalah sports\_leisure, health\_beauty, furniture\_decor, computers\_accessories Total order dari ke 5 kategori tersebut di tahun 2017 melebihi 16 ribu berdasarkan data e-commerce ini. jadi untuk para seller yang ingin memperluas daya jual barangnya, sebaiknya mulai memasuki pasar kategori ini agar banyak dilihat orang. Karena ke 5 kategori tersebut adalah suatu hal yang sering dibeli oleh pembeli, seharusnya untuk tiap tahun permintaan di 5 kategori tersebut akan terus bertambah seiring bertambahnya pembeli.
- Pertanyaan 2. Apa saja 5 kategori barang terlaris di tahun 2017? Berdasarkan bar chart yang sudah dilihat tadi, ternyata ada 3 kategori yang memiliki nilai tertinggi yang sama. yaitu arts\_and\_craftsmanship, fashion\_childrens\_clothes, dan la\_cuisine. Untuk kategori dengan skor terburuk, jatuh kepada diapers\_and\_hygiene. Berdasarkan nilai scoring ini, sudah lumayan banyak orang yang menyukai barang yang dijual di kategori arts\_and\_craftsmanship, fashion\_childrens\_clothes, dan la\_cuisine. Lalu ada 3 kategori yang mempunyai nilai rata rata skor terburuk yaitu diapers\_and\_hygiene, security\_and\_services, small\_appliances\_home\_oven\_and\_coffee. Jika pemilik e-commerce ingin untuk memperbaiki nilai score yang ada disini, pemilik e-commerce harus membawakan seller yang lebih baik lagi di kategori tersebut dan mempromosikan kategori tersebut lebih banyak ke pembeli agar para pembeli yang membeli di kategori tersebut mendapatkan barang yang berkualitas