Honor code

By submitting this assignment, I affirm the following:

1. All work presented in this assignment is my own. I have not collaborated with others or copied work from any unauthorized source.
2. If I used AI tools or large language models like ChatGPT, Co-Pilot, etc., I only sought guidance or clarification. Any generated content has been fully understood and appropriately modified to align with the assignment.
3. I understand the submitted code and can explain my work if asked.

I declare that I have read, understood, and agree to abide by this honor code.

Name: Paola D'Incecco

Student number: 775206

Date: 05/11/2025

1. Missing values table

Attribute	# of missing values
age_bracket	**53**
tier	**28**
gender	**152**
oPhone	**50**
oWatch	**40**
oPods	**45**
oTV	**30**
date	**17**
card	**20**

2. Total number of observations (rows) in orange_data_clean: **19,567**

3. Total number of customers who own multiple products: **8,033**

4. Total number of female customers in the age group 18-25 who purchased using a Visa or Mastercard credit card: **1,825**

5. Percentage of customers older than 25 who own multiple products purchased with a debit card: **13.61%**

6. Total number of customers who own all four products: **89**

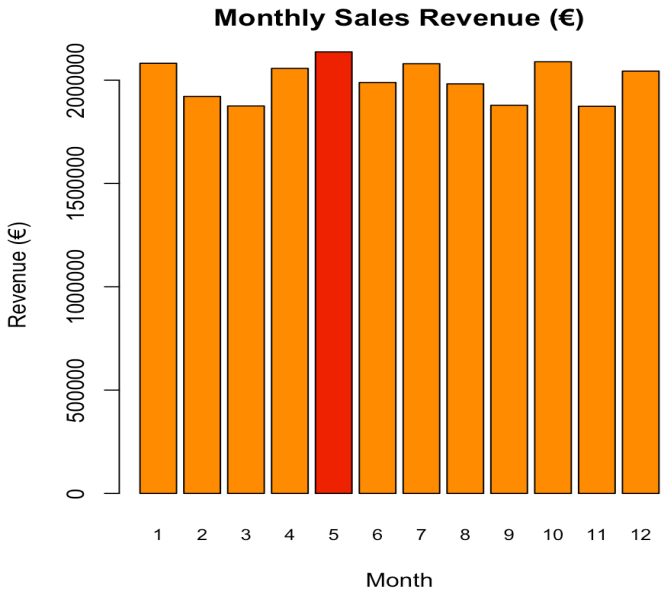
7. Average number of products purchased by tier:

Tier	Average number of products purchased
silver	**1.50**
gold	**1.48**
platinum	**1.50**

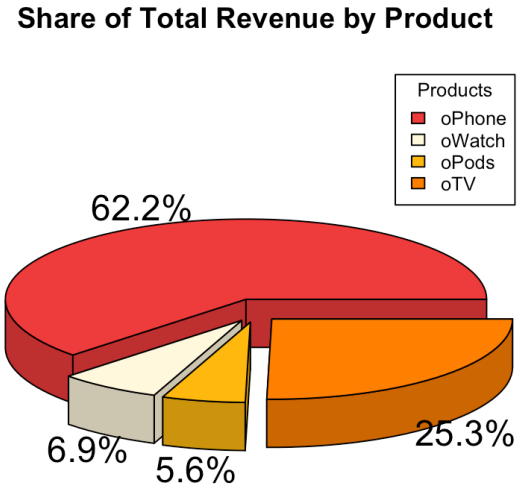
8. a) Total sales revenue from all the customers: **24,008,100**
   b) Month with the highest sales revenue: **month 5 with 2,136,900**
   c) Sales revenue from each product:

Product	Sales revenue
oPhone	**14,938,800**
oWatch	**1,645,500**
oPods	**1,341,300**
oTV	**6,082,500**

9. a) Bar chart to visualize revenue by month:



b) Pie chart to visualize each product's share of revenue:



10. a) Most preferred card type among young_oPhone_owners: **Visa_debit**
    b) Average number of products purchased by young_oPhone_owners: **1.69**

11. Insight 1: (answer in bullet points, max 150 words, excluding graphics if any)
    Product ownership by gender

gender	Average products	Multiple products owned (%)
female	1.50	40.9
male	1.50	41.2
other	1.51	41.5

- What you observed: **The average number of products owned across all genders is almost identical. Moreover, the percentage of customers of each gender owning more than one product is extremely similar as well.**

- Why it might be happening: **It can be derived that gender is not the main driver of product ownership among the company's customer base. The reason why behind this pattern may be that the kind of products sold, marketing campaigns and, consequently, the brand positioning are equal among all genders.**
- What can Orange Inc. do about it: **Rather than targeting its customers by gender, Orange should focus more on behavioural and value-based segmentation (e.g., loyalty tier, product combinations, or spending level). Therefore, to mention one, marketing resources should be employed where behavioural differences actually exist.**

Insight 2: (answer in bullet points, max 150 words, excluding graphics if any)
Preferred card type among oTV owners older than 25.

- What you observed: **Customers older than 25 who own an oTV mostly use Visa debit cards.**
- Why it might be happening: **Because oTVs are high-value items and older customers may prefer debit cards to pay immediately rather than carrying credit card debt, even for larger purchases like an oTV. Particularly, Visa card holders could benefit from cashback, reward points, or discounts specifically for debit card transactions on high-value items like electronics.**
- What can Orange Inc. do about it: **The company may partner with Visa to run special deals (e.g., free shipping, extended warranties, or products bundles) for Visa debit users of all ages. This way, it would create a financial incentive to buy more products and pay directly by Visa debit card, reinforcing such payment behaviour among all customers.**

12. (answer in bullet points, max 150 words, excluding graphics if any)
The following information and data should be derived:
    - **Current number of customers owning 1, 2, 3+ products.**
    - **Products owned and revenues per customer.**
    - **Average revenue per customer segment (based on products owned).**
    - **Total revenues from 3+ product customers.**
    - **(Potential) Percentage of 2-product customers likely to buy a 3rd one under a discount.**
    - **Total revenue before discount, after discount, after 2-product customers buy a 3rd one.**

    The following assumptions should be made:
    - **Average revenue per customer reflects typical spending for each product count.**
    - **Discount only applies to customers buying 3+ products together.**
    - **20% of 2-product customers buy a 3rd product.**

    Results:
    - **Total revenues before discount: € 24,008,100.**
    - **Total revenues after discount (before the upgrade scenario): € 23,613,765.**
    - **Total revenues after discount (after the upgrade scenario): € 26,308,482.**