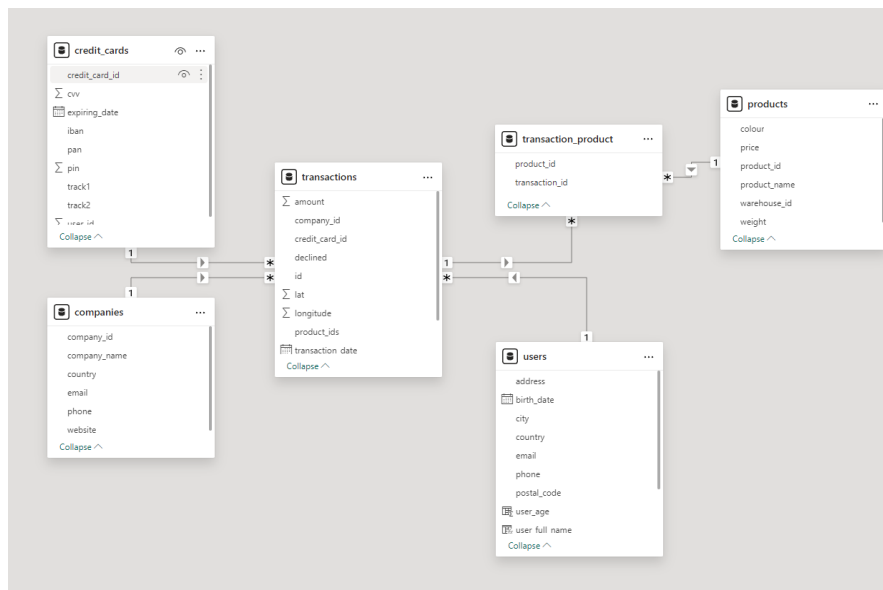# Task 5.01.

Level 1.
Exercise 1.

A database, `transactions_db`, containing data from a company selling products online, was used to create reports in Power BI. The database was upload via connection to MySQL.

ER diagram

Exercise 2.

Evaluation of the total sum of transactions over the years.
The business objective is €25,000 for each year.

Total Amount

€ 24.829

Goal:
€ 25.000

The KPI was set up to track the total sum of all transactions, including declined ones, against the annual business goal of €25,000. In 2021, the total transaction amount exceeded this goal by six times, indicating strong performance. In 2022, data for the first three months alone shows a total transaction sum of €24,829, nearly reaching the annual target already — suggesting positive dynamics for the rest of the year.

Exercise 3.

The average of the transactions made during 2021 visualized in a meter. The business objective for average sales is set at € 250.

A DAX measure was created to calculate the average amount of valid (non-declined) transactions specifically for 2021. Declined transactions were not taking into account because business objective is sales.

```
avg_sales_2021 =
CALCULATE(
    AVERAGE('transactions'[amount]),
    'transactions'[declined] = False,
    YEAR('transactions'[transaction_date]) = 2021)
```

However, on the dashboard, a more general DAX measure was applied to calculate the average of all valid transactions, excluding declined ones.

```
avg_sales =
CALCULATE(
    AVERAGE('transactions'[amount]),
    'transactions'[declined] = False)
```

To facilitate filtering by year, a new column, `transaction_year`, was added to the `transactions` table. This allows a slicer to dynamically adjust the gauge, reflecting the average of valid transaction amounts (sales) for the selected year.
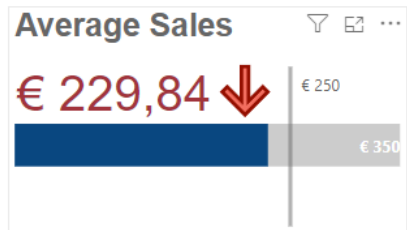
Average Sales

€ 265,85 ⬆ € 250

€ 350
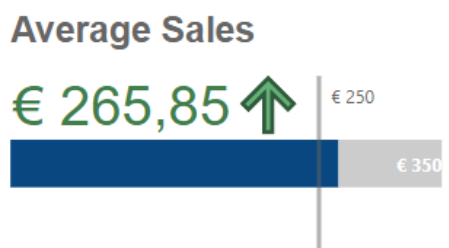
For 2021, the average transaction amount met and exceeded the €250 business goal, as visualized in the linear gauge chart.

Exercise 4.

The average of the transactions made during 2022.
The business objective for average sales is € 250.

By selecting 2022 in the slicer, the gauge dynamically displays the average of valid transactions for the year.

Currently, the average sales for the first three months of 2022 is below the target. However, as the year progresses, there remains potential for improvement, and the average could still meet or exceed the business objective by year-end.
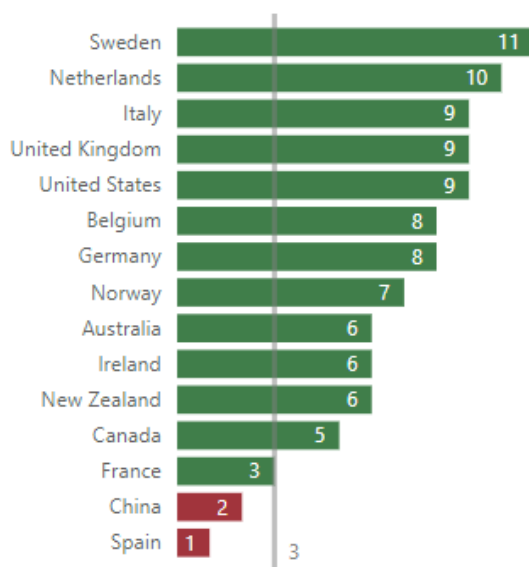
Exercise 5.

The number of distinct companies participating in transactions by country. The business goal is to ensure at least 3 participating companies per country.

A general DAX measure was created to calculate the number of unique companies involved in transactions.

```
n_companies =
DISTINCTCOUNT(transactions[company_id])
```

By applying country-level granularity in the visualization, this measure displays the number of active companies for each country.

Number of Participating Companies

Country	Number
Sweden	11
Netherlands	10
Italy	9
United Kingdom	9
United States	9
Belgium	8
Germany	8
Norway	7
Australia	6
Ireland	6
New Zealand	6
Canada	5
France	3
China	2
Spain	1

Most countries meet the target of at least 3 active companies per country. However, activity is lower in Spain and China, and France also falls close to the threshold, suggesting that these markets may need additional attention to reach desired activity levels.

Exercise 6.

The amount of declined transactions over time. The business goal is to maintain fewer than 10 declined transactions per month.

A DAX measure was created to count the declined transactions:

```
n_declined_transactions =
 CALCULATE(
    COUNT(transactions[id]),
    transactions[declined]=True)
```

Using monthly granularity, the visualization shows the trend of declined transactions over time.

Declined Transactions

15 %

Number

87

Number of Declined Transactions
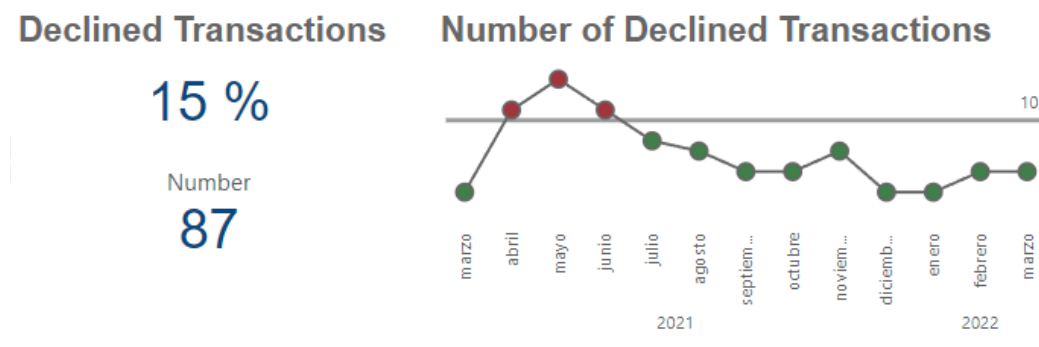
From April to June 2021, the number of declined transactions exceeded the target. However, all subsequent months met the goal, suggesting that the company likely made effective efforts to reduce declined transactions. Data for these months in 2022 is still pending, but this trend indicates promising progress.
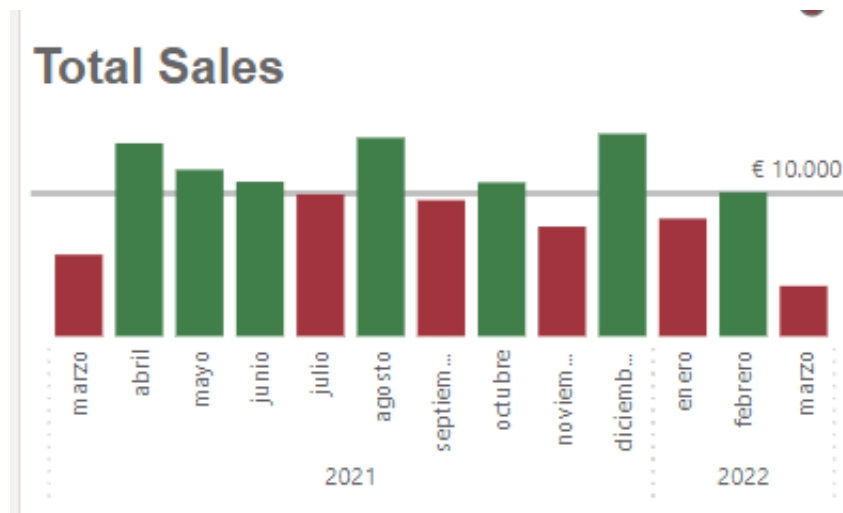
Exercise 7.

Sum of sales by month visualized in grouped column chart. The company aims to achieve a total sales amount of at least € 10,000 per month.

The new DAX measure was created to calculate the sum of sales.

```
total_sales =
CALCULATE(
    SUM('transactions'[amount]),
    'transactions'[declined] = False)
```

Using monthly granularity, the visualization displays total sales over time.

In March, July, September, and November of 2021, as well as January and March of 2022, sales fell below the €10,000 target. The dip in sales during July, September and January may be partially attributed to reduced user activity during pre-/post-holiday/holiday periods. The other months (both years have low sales in March) indicate potential areas for improvement in sales strategies to meet the business goal.

Exercise 8.

Transactions carried out by each user:
- user name and surname (in one column);
- user age;
- average amount of transactions in euros;
- average amount of transactions in dollars
  (conversion: € 1 = $ 1.08).

Users who had an average of € 300 or more and $ 320 or more in their transactions are highlighted.

Two new columns were added to the `users` table – `'user_full_name'` and `'user_age'`.

```
user_full_name =
'users'[user_name] & " " & 'users'[user_surname]
```

```
user_age =
DATEDIFF('users'[birth_date], TODAY(), YEAR)
```

DAX measures were created to calculate average transaction amounts.

```
avg_amount_user_eu =
AVERAGEX(
    VALUES(transactions[user_id]),
    CALCULATE(AVERAGE(transactions[amount]))
)
```

```
avg_amount_user_dol =
[avg_amount_user_eu] * 1.08
```

User Information

| User Name	User Age	Avg Transactions, €	$
Sacha Compton	43	€ 494,82	$534,41
Gary Robbins	29	€ 485,31	$524,13
Zelenia Good	36	€ 481,75	$520,29
Brody Goodwin	42	€ 478,54	$516,82
Guinevere Kemp	37	€ 476,75	$514,89
Genevieve Nolan	34	€ 474,76	$512,74
Astra Baldwin	25	€ 472,18	$509,95
Clark Hewitt	27	€ 471,78	$509,52
Irma Whitehead	36	€ 471,47	$509,19
Urielle Holman	39	€ 466,46	$503,78
Damian Mcgee	36	€ 465,97	$503,25
Duncan Romero	34	€ 460,82	$497,69

Users with an average transaction value of €300 or more (or $320 or more) are highlighted. This table provides a comprehensive overview of users' transaction behaviours and helps identify high-performing users based on their average transaction amounts.
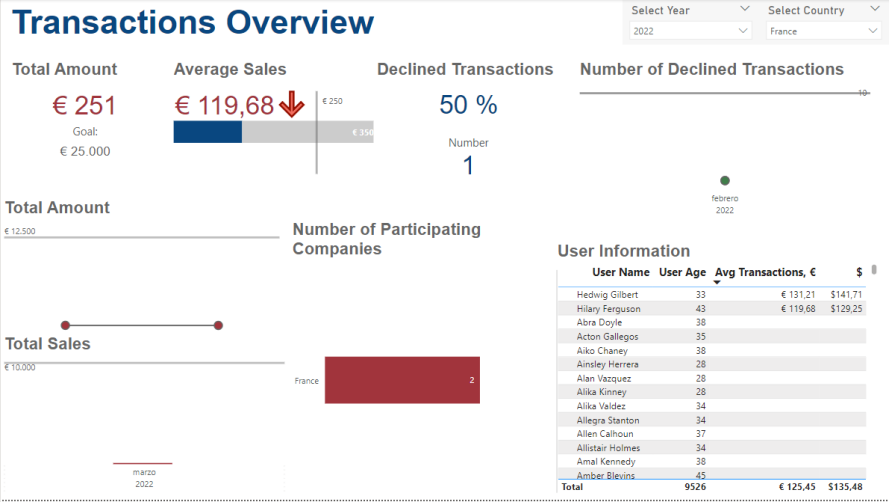
Exercise 9.

The French market needs attention, as it has fewer than 3 active companies in 2022, with 50% of transactions declined. Additionally, most users are inactive or low-performing. Improvements should target user engagement (marketing) and company-level activity (business initiatives) to drive growth.

2021
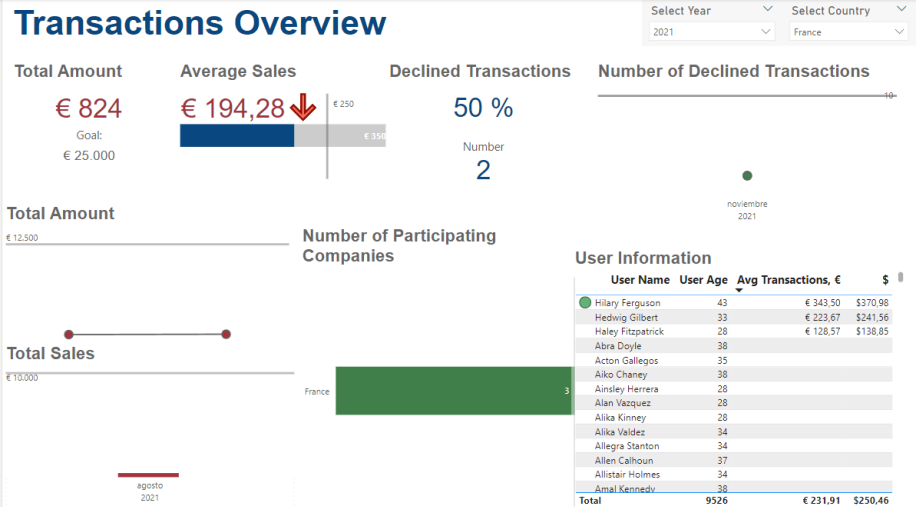
2022

Level 2.
Exercise 1.
The monthly trend of transactions in 2021, with a business goal of achieving at least € 12,500 per month.

A DAX measure was created to calculate the total amount of the transactions for 2021.

```
total_amount_2021 =
CALCULATE(
    SUM('transactions'[amount]),
    YEAR('transactions'[transaction_date]) = 2021)
```

However, in the dashboard, a general DAX measure for the total amount of transactions was utilized, filtered by year to visualize monthly totals.
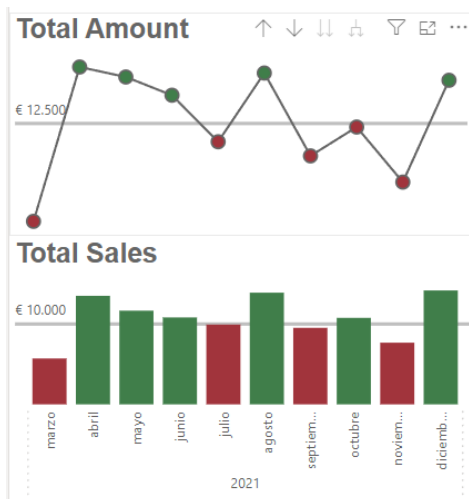
The established goal was not met in March, July, September, October, and November. Despite a high number of declined transactions from April to June 2021, total transaction amounts exceeded the target, highlighting these months as strong sales periods with strong potential, that should be leveraged.

Exercise 2.

Average sales in Germany. The business goal is to achieve € 250 per year.

A DAX measure was created to calculate average sales in Germany.

```
avg_sales_Germany =
CALCULATE(
    AVERAGE(transactions[amount]),
    companies[country] = "Germany",
    transactions[declined] = FALSE()
)
```

However, to visualize the average sales in Germany, a filter by country was applied in the dashboard.

2021

Average Sales

€ 251,23 ⬆ | € 250

€ 350

2022

Average Sales

€ 203,71 ⬇ | € 250

€ 350
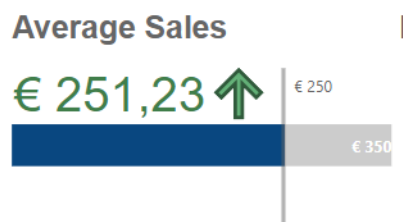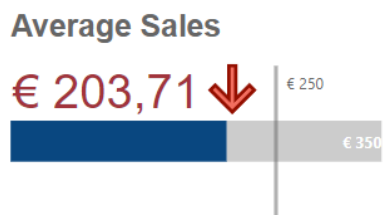
The business goal was met in 2021; however, in 2022, average sales are currently at 80% of the target, suggesting potential to reach it by year-end.

Exercise 3.
In March, July, September, October, and November, the transaction amounts fell below the proposed goal of €12,500, indicating potential areas for improvement in sales strategies.

Level 3.
Exercise 1.

Transactions carried out by users:
- The key statistical measures of the variables relevant to understanding the transactions made by the users.
- Quantity of products purchased by each user.
- Average purchases made per user, users that have an average of purchases greater than 150 are highlighted.
- the price of the most expensive product purchased by each user.
- the geographical distribution of users.

The following statistical measures were taking into account:
1) User metrics:
   - total number of users
   - percentage of active users: the proportion of users who have participated in transactions
     ```
     %_active_users =
     DISTINCTCOUNT(transactions[user_id]) / count(users[user_id])
     ```

2) Averages for users:
   - average purchase amount: the mean spending per transaction
   - average total purchase: the mean overall spending per user
     ```
     avg_purchase_user =
     DIVIDE([total_sales], DISTINCTCOUNT(transactions[user_id]), 0)
     ```

3) Purchase behaviour
   - average number of purchases
     ```
     avg_n_purchase_user =
     DIVIDE([n_valid_transactions], DISTINCTCOUNT(transactions[user_id]), 0)
     ```

   - median number of purchases
     ```
     median_n_purchase_user =
     MEDIANX(
         VALUES(transactions[user_id]),
         CALCULATE(COUNTROWS(transactions),
         transactions[declined] = FALSE())
     )
     ```

4) Declined transaction: percentage of users experiencing declined transactions

```
%_declined_transactions =
[n_declined_transactions] / COUNT(transactions[id])


%_user_with_declined_trans =
SUMX(
    VALUES(transactions[user_id]),
    IF(ISBLANK([%_declined_transactions]), 0, 1)
    ) / DISTINCTCOUNT(transactions[user_id])
```

5) Individual user metrics:
- average amount of purchases
- total purchase
- number of purchases

```
n_valid_transactions =
 CALCULATE(
    COUNT(transactions[id]),
    transactions[declined]=FALSE())
```

- number of distinct purchased products

```
n_products =
CALCULATE(
    DISTINCTCOUNT(transaction_product[product_id]),
    transactions[declined] = FALSE()
)
```

- price of the most expensive product purchased

```
most_expensive_product =
CALCULATE(
    MAX(products[price]),
    CROSSFILTER(
        transaction_product[product_id],
        products[product_id],
        Both),
    transactions[declined] = FALSE()
)
```

- percentage of declined transactions

```
%_declined_transactions =
[n_declined_transactions] / COUNT(transactions[id])
```

The geographical distribution of users by city (with bubble size for user count and colour intensity for transaction volume) enables targeting for marketing efforts. Clicking on a city reveals user-specific metrics, making it easier to analyse key markets; filtering by country allows to analyse three primary markets: the US, Canada, and the UK.

User Analysis

Total Number
275

Active Users
78,5 %

Average Purchase
€ 259,01

Average Total Purchase
€ 599,56

Number of Purchases

Average	Median
2,31	**1,00**

Have Declined Transactions
4,2 %

Name	Average Purchase	Total Purchase	Number of Purchases	Number of Purchased Products	The Most Expensive Product	Declined Transactions
Lynn Riddle	€ 293,63	€ 11.451,57	39	25	$195,94	
Hedwig Gilbert	€ 254,78	€ 9.681,60	38	25	$195,94	50 %
Ocean Nelson	€ 247,14	€ 9.638,30	39	24	$195,94	25 %
Brennan Wynn	€ 264,63	€ 6.615,85	25	25	$195,94	
Kenyon Hartman	€ 236,78	€ 5.682,68	24	26	$195,94	50 %
Slade Poole	€ 224,39	€ 4.936,48	22	26	$195,94	
Kim Mooney	€ 204,56	€ 3.477,59	17	21	$195,94	
Neil Powers	€ 281,90	€ 1.409,48	5	10	$172,78	
Lewis Melendez	€ 459,79	€ 919,58	2	4	$167,20	
Camilla Roach	€ 445,48	€ 890,96	2	5	$172,78	
Chloe Keith	€ 434,62	€ 869,24	2	7	$172,78	
Drake Walsh	€ 434,54	€ 869,08	2	4	$114,09	
Zephania Collins	€ 418,11	€ 836,21	2	5	$141,01	
Total	**€ 259,01**	**€ 129.505,59**	**500**	**26**	**$195,94**	**15 %**

Number of Users per City
Color represent the number of purchases

The dashboard provides an overview of user transactions, highlighting active users, purchasing behaviours, and areas for improvement regarding declined transactions.

A notable insight is that most users perform only one transaction (median purchases = 1), suggesting potential to increase repeat engagement. Additionally, some users remain inactive, indicating further marketing focus is needed to encourage initial purchases. Several high-performing users experience a high rate of declined transactions (up to 50%), which may hint at technical transaction issues, rather than solely client card problems.

Additional Metrics and Filters:
- More metrics can be included, such as days of inactivity, to assess user engagement levels.
- Implementing filters by age group can also enhance insights into purchasing behaviour across different demographics.
- Comparing metrics by country can reveal trends and performance differences, providing ideas for targeted marketing strategies.
- Additional visualizations of distributions and dependencies (e.g., user age, valid and declined transactions, purchase amounts), combined with country filters, can help better calibrate marketing approaches by identifying potential weak points.