**📊 Data Analysis Assignment: Marketing Spend vs. Sales**

With this assignment, we are introducing you to **data mining** and **basic regression analysis**. By analyzing digital marketing data, you’ll both improve your technical skills and apply methods that are commonly used in the business world.

**🔍 Dataset: Digital Ads & Sales**

Use the provided **“Digital Ads”** dataset and complete the following analyses step-by-step.

**🎯 TASKS**

**A. Descriptive Statistics**

a. Calculate the following statistical values for each numerical variable:

* **Mean**
* **Median (Q2)**
* **Mode**
* **Standard Deviation**
* **Variance**
* **Range (Max - Min)**
* **Minimum Value**
* **Maximum Value**
* **Sum**
* **Count (COUNTA)**
* **Number of Missing Values**

b. Generate the above statistical summaries using Excel’s **Data Analysis Toolpak**.

c. Create a **correlation matrix** for all numeric variables using Excel’s Data Analysis Toolpak.

d. Use the **“DAYS”** column to create a **pivot table** based on the days of the week, and interpret how it affects sales.

**1. Missing Value Analysis**

* Check all variables for any **missing (null or empty)** values.
* Specify how many missing values exist, if any.
* Explain how missing values can be handled (e.g., **deletion**, **imputation**, etc.).

**2. Outlier Analysis**

* Use the **Tukey method (IQR method)** to detect outliers for each variable.
* Discuss whether outliers should be **removed** or **transformed**.
* Comment on how outliers might impact analysis results.

**3. Regression Charts**

* Graphically show regression lines for the following relationships:
  + **SALES vs Google Ads**
  + **TikTok vs Sales**
* Interpret the **direction** and **strength** of the relationships in the graphs.

**4. Multiple Linear Regression**

* Use **SALES** as the **dependent variable**.
* Create a regression model in the format:

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SALES = β₀ + β₁(Google Ads) + β₂(Meta) + β₃(TikTok) + β₄(Influencer) + ε

* Interpret the **regression coefficients**.

**5. 💸 $1000 Investment Scenario**

* Assume you have a **$1000 digital ad budget**.
* Decide how you would **distribute** this budget among:
  + **Google Ads**
  + **Meta**
  + **Influencer**
  + **TikTok**
* Justify your decision based on:
  + **Data-driven analysis results**
  + **Expected ROI (Return on Investment)** from each channel

**6. 💼📊 Investment Decision: CLTV (Customer Lifetime Value)**

Assumptions:

* **1-year retention rate**: 42%
* **Monthly revenue per user (ARPU)**: $15
* **With $1000 ad spend**:
  + 1000 people became aware of the product
  + **1.5% (15 people)** became premium users

Tasks:

* Calculate the **Customer Lifetime Value (CLTV)**
* Interpret the results and explain whether or not to invest in this application