MARKETING CAMPAIGN SQL QUERY, ALONG WITH RESULTS AND INSIGHTS

The table ("marketing") was queried using SQL Server Management Studio (MS SQL)

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-- Viewing the dataset
```
SELECT *
FROM marketing;
```

-- Changing the value format in CTR to enable arithmetic calculations
```
UPDATE marketing
SET CTR = REPLACE (CTR, '%', '');

ALTER TABLE marketing
ALTER COLUMN CTR FLOAT;
```

--1. Correlations
-- A. Correlation between CPC and CTR
```
SELECT
       ROUND((COUNT(*) * SUM(CTR * Daily_Average_CPC) - SUM(CTR) *
       SUM(Daily_Average_CPC)) /
        (SQRT(COUNT(*) * SUM(POWER(CTR, 2)) - POWER(SUM(CTR), 2)) *
       SQRT(COUNT(*) * SUM(POWER(Daily_Average_CPC, 2)) -
       POWER(SUM(Daily_Average_CPC, 2))),4)
   AS correlation_coefficient_CPC_and_CTR
FROM marketing;
```

	correlation_coefficient_CPC_and_CTR
1	0.0871

-- Correlation between CPC and CTR across various dimensions
```
SELECT Campaign,
   ROUND((COUNT(*) * SUM(CTR * Daily_Average_CPC) - SUM(CTR) *
SUM(Daily_Average_CPC)) /
   (SQRT(COUNT(*) * SUM(POWER(CTR, 2)) - POWER(SUM(CTR), 2)) *
   SQRT(COUNT(*) * SUM(POWER(Daily_Average_CPC, 2)) -
POWER(SUM(Daily_Average_CPC), 2))),4)
   AS correlation_coefficient_CPC_and_CTR
FROM marketing
GROUP BY Campaign;
```

	Campaign	correlation_coefficient_CPC_and_CTR
1	Summer	0.0505
2	Fall	0.0899
3	Spring	0.1189

```
SELECT Channel,
   ROUND((COUNT(*) * SUM(CTR * Daily_Average_CPC) - SUM(CTR) *
SUM(Daily_Average_CPC)) /
   (SQRT(COUNT(*) * SUM(POWER(CTR, 2)) - POWER(SUM(CTR), 2)) *
   SQRT(COUNT(*) * SUM(POWER(Daily_Average_CPC, 2)) -
POWER(SUM(Daily_Average_CPC), 2))),4)
```

```
    AS correlation_coefficient_CPC_and_CTR
FROM marketing
GROUP BY Channel;
```

	Channel	correlation_coefficient_CPC_and_CTR
1	Facebook	0.0006
2	Pinterest	0.0511
3	Instagram	-0.1153

```
SELECT City_Location,
   ROUND((COUNT(*) * SUM(CTR * Daily_Average_CPC) - SUM(CTR) *
SUM(Daily_Average_CPC)) /
   (SQRT(COUNT(*) * SUM(POWER(CTR, 2)) - POWER(SUM(CTR), 2)) *
    SQRT(COUNT(*) * SUM(POWER(Daily_Average_CPC, 2)) -
POWER(SUM(Daily_Average_CPC), 2))),4)
   AS correlation_coefficient_CPC_and_CTR
FROM marketing
GROUP BY City_Location;
```

	City_Location	correlation_coefficient_CPC_and_CTR
1	London	0.0917
2	Birmingham	0.0791
3	Manchester	0.0921

```
SELECT Device,
   ROUND((COUNT(*) * SUM(CTR * Daily_Average_CPC) - SUM(CTR) *
SUM(Daily_Average_CPC)) /
   (SQRT(COUNT(*) * SUM(POWER(CTR, 2)) - POWER(SUM(CTR), 2)) *
    SQRT(COUNT(*) * SUM(POWER(Daily_Average_CPC, 2)) -
POWER(SUM(Daily_Average_CPC), 2))),4)
   AS correlation_coefficient_CPC_and_CTR
FROM marketing
GROUP BY Device;
```

	Device	correlation_coefficient_CPC_and_CTR
1	Desktop	0.011
2	Mobile	0.0275

```
SELECT Ad,
   ROUND((COUNT(*) * SUM(CTR * Daily_Average_CPC) - SUM(CTR) *
SUM(Daily_Average_CPC)) /
   (SQRT(COUNT(*) * SUM(POWER(CTR, 2)) - POWER(SUM(CTR), 2)) *
    SQRT(COUNT(*) * SUM(POWER(Daily_Average_CPC, 2)) -
POWER(SUM(Daily_Average_CPC), 2))),4)
   AS correlation_coefficient_CPC_and_CTR
FROM marketing
GROUP BY Ad;
```

	Ad	correlation_coefficient_CPC_and_CTR
1	Collection	0.0539
2	Discount	0.3365

Insights

There was generally no meaningful correlation between CPC and CTR, with a correlation coefficient of 0.087. This weak relationship between CPC and CTR remained consistent when measured across different dimensions, such as campaign period, channel, city location, and device. However, ads featuring discounts showed some positive correlation (0.3365).

-- B. Correlation between Impressions and Clicks
```
SELECT
   ROUND((COUNT(*) * SUM(Impressions * CAST(Clicks AS FLOAT)) - SUM(Impressions) *
SUM(CAST(Clicks AS FLOAT))) /
   (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Clicks AS FLOAT), 2)) - POWER(SUM(CAST(Clicks
AS FLOAT)), 2))),4)
   AS correlation_coefficient_Impression_Clicks
FROM marketing;
```

	correlation_coefficient_Impression_Clicks
1	0.7868

Correlation between Impressions and Clicks *across various dimensions*

```
SELECT Campaign,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Clicks AS FLOAT)) - SUM(Impressions) *
SUM(CAST(Clicks AS FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Clicks AS FLOAT), 2)) - POWER(SUM(CAST(Clicks
AS FLOAT)), 2))),4)
    AS correlation_coefficient_Impression_Clicks
FROM marketing
GROUP BY Campaign;
```

	Campaign	correlation_coefficient_Impression_Clicks
1	Summer	0.7928
2	Fall	0.6309
3	Spring	0.6726

```
SELECT City_Location,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Clicks AS FLOAT)) - SUM(Impressions) *
SUM(CAST(Clicks AS FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Clicks AS FLOAT), 2)) - POWER(SUM(CAST(Clicks
AS FLOAT)), 2))),4)
    AS correlation_coefficient_Impression_Clicks
FROM marketing
GROUP BY City_Location;
```

	City_Location	correlation_coefficient_Impression_Clicks
1	London	0.7381
2	Birmingham	0.8279
3	Manchester	0.7109

```
SELECT Channel,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Clicks AS FLOAT)) - SUM(Impressions) *
SUM(CAST(Clicks AS FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Clicks AS FLOAT), 2)) - POWER(SUM(CAST(Clicks
AS FLOAT)), 2))),4)
```

AS correlation_coefficient_Impression_Clicks
FROM marketing
GROUP BY Channel;

	Channel	correlation_coefficient_Impression_Clicks
1	Facebook	0.7972
2	Pinterest	0.7539
3	Instagram	0.8346

SELECT Device,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Clicks AS FLOAT)) - SUM(Impressions) *
SUM(CAST(Clicks AS FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Clicks AS FLOAT), 2)) - POWER(SUM(CAST(Clicks
AS FLOAT)), 2))),4)
    AS correlation_coefficient_Impression_Clicks
FROM marketing
GROUP BY Device;

	Device	correlation_coefficient_Impression_Clicks
1	Desktop	0.903
2	Mobile	0.8521

SELECT Ad,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Clicks AS FLOAT)) - SUM(Impressions) *
SUM(CAST(Clicks AS FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Clicks AS FLOAT), 2)) - POWER(SUM(CAST(Clicks
AS FLOAT)), 2))),4)
    AS correlation_coefficient_Impression_Clicks
FROM marketing
GROUP BY Ad;

	Ad	correlation_coefficient_Impression_Clicks
1	Collection	0.787
2	Discount	0.7772

Insights

Throughout the entire campaign period, there was a positive correlation between Impressions and Clicks, indicating that as ads were shown more frequently, the number of clicks increased. This trend was consistent across different dimensions.

-- C. Correlation between Impressions and Engagement (Likes + Shares + Comments)

```
SELECT
   ROUND((COUNT(*) * SUM(Impressions * CAST(Likes_Reactions + Shares + Comments
AS FLOAT))    - SUM(Impressions) * SUM(CAST(Likes_Reactions + Shares + Comments AS
FLOAT))) /
   (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Likes_Reactions + Shares + Comments AS
FLOAT), 2)) - POWER(SUM(CAST(Likes_Reactions + Shares + Comments AS FLOAT)), 2))),4)
   AS correlation_coefficient_Impression_Engagement
FROM marketing;
```

	correlation_coefficient_Impression_Engagement
1	0.2077

-- Correlation between Impressions and Engagement (Likes + Shares + Comments)
across various dimensions

```
SELECT Campaign,
   ROUND((COUNT(*) * SUM(Impressions * CAST(Likes_Reactions + Shares + Comments
AS FLOAT))    - SUM(Impressions) * SUM(CAST(Likes_Reactions + Shares + Comments AS
FLOAT))) /
   (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Likes_Reactions + Shares + Comments AS
FLOAT), 2)) - POWER(SUM(CAST(Likes_Reactions + Shares + Comments AS FLOAT)), 2))),4)
   AS correlation_coefficient_Impression_Engagement
FROM marketing
GROUP BY Campaign;
```

	Campaign	correlation_coefficient_Impression_Engagement
1	Summer	0.183
2	Fall	0.1488
3	Spring	0.2537

```sql
SELECT City_Location,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Likes_Reactions + Shares + Comments
AS FLOAT))    - SUM(Impressions) * SUM(CAST(Likes_Reactions + Shares + Comments AS
FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
     SQRT(COUNT(*) * SUM(POWER(CAST(Likes_Reactions + Shares + Comments AS
FLOAT), 2)) - POWER(SUM(CAST(Likes_Reactions + Shares + Comments AS FLOAT)), 2))),4)
    AS correlation_coefficient_Impression_Engagement
FROM marketing
GROUP BY City_Location;
```

	City_Location	correlation_coefficient_Impression_Engagement
1	London	0.0389
2	Birmingham	0.2576
3	Manchester	0.1758

```sql
SELECT Channel,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Likes_Reactions + Shares + Comments
AS FLOAT))    - SUM(Impressions) * SUM(CAST(Likes_Reactions + Shares + Comments AS
FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
     SQRT(COUNT(*) * SUM(POWER(CAST(Likes_Reactions + Shares + Comments AS
FLOAT), 2)) - POWER(SUM(CAST(Likes_Reactions + Shares + Comments AS FLOAT)), 2))),4)
    AS correlation_coefficient_Impression_Engagement
FROM marketing
GROUP BY Channel;
```

	Channel	correlation_coefficient_Impression_Engagement
1	Facebook	0.1961
2	Pinterest	0.3372
3	Instagram	0.0356

```sql
SELECT Device,
    ROUND((COUNT(*) * SUM(Impressions * CAST(Likes_Reactions + Shares + Comments
AS FLOAT))    - SUM(Impressions) * SUM(CAST(Likes_Reactions + Shares + Comments AS
FLOAT))) /
    (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
     SQRT(COUNT(*) * SUM(POWER(CAST(Likes_Reactions + Shares + Comments AS
FLOAT), 2)) - POWER(SUM(CAST(Likes_Reactions + Shares + Comments AS FLOAT)), 2))),4)
```

AS correlation_coefficient_Impression_Engagement
FROM marketing
GROUP BY Device;

	Device	correlation_coefficient_Impression_Engagement
1	Desktop	0.1332
2	Mobile	0.1257

SELECT Ad,
   ROUND((COUNT(*) * SUM(Impressions * CAST(Likes_Reactions + Shares + Comments
AS FLOAT))   - SUM(Impressions) * SUM(CAST(Likes_Reactions + Shares + Comments AS
FLOAT))) /
   (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
    SQRT(COUNT(*) * SUM(POWER(CAST(Likes_Reactions + Shares + Comments AS
FLOAT), 2)) - POWER(SUM(CAST(Likes_Reactions + Shares + Comments AS FLOAT)), 2))),4)
   AS correlation_coefficient_Impression_Engagement
FROM marketing
GROUP BY Ad;

	Ad	correlation_coefficient_Impression_Engagement
1	Collection	0.27
2	Discount	0.3324

Insights

A positive correlation was observed between Impressions and Engagements (Likes, Shares, and Comments), although the correlation was not as strong as observed between Impression and Clicks Of the various cities, Birmingham had the highest correlation between Impressions and Engagements. Similarly, Pinterest showed the strongest correlation among the campaign channels.

--D. Correlation between Impressions and Conversion
SELECT
     ROUND((COUNT(*) * SUM(Impressions * CAST(Conversions AS FLOAT)) -
     SUM(Impressions) * SUM(CAST(Conversions AS FLOAT))) /
     (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
     SQRT(COUNT(*) * SUM(POWER(CAST(Conversions AS FLOAT), 2)) -
     POWER(SUM(CAST(Conversions
     AS FLOAT)), 2))),4)
AS correlation_coefficient_Impression_Conversion
FROM marketing

	correlation_coefficient_Impression_Conversion
1	0.0263

--Correlation between Impressions and Conversion across various dimensions

SELECT Campaign,
        ROUND((COUNT(*) * SUM(Impressions * CAST(Conversions AS FLOAT)) -
        SUM(Impressions) * SUM(CAST(Conversions AS FLOAT))) /
        (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions),
        2)) * SQRT(COUNT(*) * SUM(POWER(CAST(Conversions AS FLOAT), 2)) -
        POWER(SUM(CAST(Conversions
        AS FLOAT)), 2))),4)
        AS correlation_coefficient_Impression_Conversion
FROM marketing
GROUP BY Campaign;

	Campaign	correlation_coefficient_Impression_Conversion
1	Summer	0.0814
2	Fall	-0.1243
3	Spring	-0.1427

SELECT Channel,
      ROUND((COUNT(*) * SUM(Impressions * CAST(Conversions AS FLOAT)) -
      SUM(Impressions) * SUM(CAST(Conversions AS FLOAT))) /
      (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
      SQRT(COUNT(*) * SUM(POWER(CAST(Conversions AS FLOAT), 2)) -
      POWER(SUM(CAST(Conversions
      AS FLOAT)), 2))),4)
      AS correlation_coefficient_Impression_Conversion
FROM marketing
GROUP BY Channel;

	Channel	correlation_coefficient_Impression_Conversion
1	Facebook	-0.051
2	Pinterest	-0.0508
3	Instagram	0.1302

```sql
 SELECT City_Location,
       ROUND((COUNT(*) * SUM(Impressions * CAST(Conversions AS FLOAT)) -
       SUM(Impressions) * SUM(CAST(Conversions AS FLOAT))) /
       (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
       SQRT(COUNT(*) * SUM(POWER(CAST(Conversions AS FLOAT), 2)) -
       POWER(SUM(CAST(Conversions
       AS FLOAT)), 2))),4)
       AS correlation_coefficient_Impression_Conversion
FROM marketing
GROUP BY City_Location;
```

	City_Location	correlation_coefficient_Impression_Conversion
1	London	0.0987
2	Birmingham	-0.0437
3	Manchester	0.0044

```sql
SELECT Device,
       ROUND((COUNT(*) * SUM(Impressions * CAST(Conversions AS FLOAT)) -
       SUM(Impressions) * SUM(CAST(Conversions AS FLOAT))) /
       (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions), 2)) *
       SQRT(COUNT(*) * SUM(POWER(CAST(Conversions AS FLOAT), 2)) -
       POWER(SUM(CAST(Conversions
       AS FLOAT)), 2))),4)
       AS correlation_coefficient_Impression_Conversion
FROM marketing
GROUP BY Device;
```

	Device	correlation_coefficient_Impression_Conversion
1	Desktop	0.0512
2	Mobile	0.1112

```sql
SELECT Ad,
          ROUND((COUNT(*) * SUM(Impressions * CAST(Conversions AS FLOAT)) -
          SUM(Impressions) * SUM(CAST(Conversions AS FLOAT))) /
          (SQRT(COUNT(*) * SUM(POWER(Impressions, 2)) - POWER(SUM(Impressions),
          2)) * SQRT(COUNT(*) * SUM(POWER(CAST(Conversions AS FLOAT), 2)) -
          POWER(SUM(CAST(Conversions
```

```
        AS FLOAT)), 2))),4)
        AS correlation_coefficient_Impression_Conversion
FROM marketing
GROUP BY Ad;
```

	Ad	correlation_coefficient_Impression_Conversion
1	Collection	0.016
2	Discount	0.0714

INSIGHTS

No significant correlation between impressions and conversion across the dataset. However, in the Summer and Fall campaign periods, a slight negative correlation was observed.

-- 2. Campaign Performance:

-- Which campaign generated the highest number of impressions, clicks, and conversions?
-- What is the conversion rate (CVR) of each campaign?
--Which campaign period has the highest engagement (likes + shares + comments)?

SELECT Campaign AS Campaign_period,
    ROUND(SUM(Impressions),2) AS Total_impressions,
    SUM(Clicks) AS Total_clicks,
    SUM(Conversions) AS Total_conversions,
    ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)) * 100 ,2) AS CVR,
    SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,
    SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates
FROM marketing
GROUP BY Campaign
ORDER BY CVR DESC;

	Campaign_period	Total_impressions	Total_clicks	Total_conversions	CVR	Total_Engagement	Engagement_Rates
1	Summer	3459578.4	38816	12753	32.86	275253	83
2	Spring	4751611.4	57662	12613	21.87	234273	70
3	Fall	6434259	85120	14886	17.49	292213	89

The Fall campaign period saw the highest total impressions, clicks, and conversions, which also corresponded to the highest total engagement and engagement rates compared to other periods. However, the Fall period recorded the lowest conversion rate(CVR). In contrast, the Summer campaign had the highest CVR, despite having the lowest overall impressions, clicks, and conversions.

-- What is the average cost-per-click (CPC) and click-through rate (CTR) for each campaign?
SELECT Campaign,
    ROUND(AVG(CAST(daily_average_cpc AS FLOAT)),2) AS AvgCPC,
    ROUND(AVG(CAST(CTR AS FLOAT)),2) AS AvgCTR
FROM marketing
GROUP BY Campaign
ORDER BY AvgCTR DESC;

	Campaign	AvgCPC	AvgCTR
1	Fall	0.93	1.35
2	Spring	0.86	1.23
3	Summer	0.92	1.13

CTR in online advertising measures how effective an ad is at attracting potential customers, while Cost per Click (CPC) reflects how much you're spending on each click. The Fall campaign had the highest average CTR, with Summer showing the lowest. Similarly, the average CPC was also highest during the Fall campaign.

-- Campaign ROI
SELECT Campaign,
     SUM (Spend_GBP) AS Total_spend_GBP,
     SUM (Total_conversion_value_GBP) AS Total_conversion_value_GBP,
     ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI
FROM marketing
GROUP BY Campaign
ORDER BY ROI DESC;

	Campaign	Total_spend_GBP	Total_conversion_value_GBP	ROI
1	Summer	34352	484409.209837079	13.1
2	Spring	49548	498285.059708416	9.06
3	Fall	79281	749005.989870369	8.45

The Summer campaign period achieved the highest return on investment (ROI), with a value of 13.1. In contrast, the Fall campaign had the lowest ROI among all periods, recording a value of 8.45.

-- 3. Channel Effectiveness:
-- Which channel has the highest ROI?

SELECT Channel,
    SUM (Spend_GBP) AS Total_spend_GBP,
    ROUND(SUM (Total_conversion_value_GBP),2) AS Total_conversion_value_GBP,
    ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI
FROM marketing
GROUP BY Channel
ORDER BY ROI DESC;

	Channel	Total_spend_GBP	Total_conversion_value_GBP	ROI
1	Pinterest	28201	634713.8	21.51
2	Instagram	63395	684760.68	9.8
3	Facebook	71585	412225.78	4.76

Campaigns run on Pinterest yielded the highest ROI, despite having the lowest investment cost. In contrast, Facebook, which had the highest investment cost, produced the lowest ROI among the campaign channels.

-- How do impressions, clicks, and conversions vary across different channels? Which channel has the highest engagement (likes + shares + comments)?
SELECT Channel,
    ROUND(SUM(Impressions),2) AS Total_impressions,
    SUM(Clicks) AS Total_clicks,
    SUM(Conversions) AS Total_conversions,
    ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)) * 100 ,2) AS CVR,
    SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,
    SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates
FROM marketing
GROUP BY Channel
ORDER BY Total_conversions DESC;

	Channel	Total_impressions	Total_clicks	Total_conversions	CVR	Total_Engagement	Engagement_Rates
1	Pinterest	4365220.1	42982	11530	26.83	225118	68
2	Instagram	4840638.1	68655	15590	22.71	280281	84
3	Facebook	5439590.6	69961	13132	18.77	296340	89

Although Pinterest had the fewest impressions, clicks, and conversions—leading to the lowest engagement and engagement rates—it achieved the highest conversion rate (CVR)

at 26.83%. In contrast, Facebook showed the opposite trend, with the highest impressions, clicks, and engagement, but the lowest CVR at 18.77%.

-- What is the average cost-per-click (CPC) and click-through rate (CTR) for each channel?

SELECT Channel,

ROUND(AVG(Daily_Average_CPC), 2) AS Avg_CPC,

ROUND(AVG (CTR),2) AS Avg_CTR

FROM marketing

GROUP BY Channel

ORDER BY Avg_CTR DESC;

	Channel	Avg_CPC	Avg_CTR
1	Instagram	1	1.42
2	Facebook	1.04	1.3
3	Pinterest	0.67	1

Pinterest had the least average CTR and CPC.

-- 4. Geographical Insights

-- Which cities have the highest engagement rates (likes, shares, comments)?
--What is the conversation rate in each location?
SELECT City_Location,
     ROUND(SUM(Impressions),2) AS Total_impressions,
     SUM(Clicks) AS Total_clicks,
     SUM(Conversions) AS Total_conversions,
     ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)) * 100 ,2) AS CVR,
     SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,
     SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates
FROM marketing
GROUP BY City_Location
ORDER BY CVR DESC;

	City_Location	Total_impressions	Total_clicks	Total_conversions	CVR	Total_Engagement	Engagement_Rates
1	Birmingham	3971619.6	44455	12798	28.79	237874	72
2	Manchester	5002473.2	62869	14374	22.86	278159	84
3	London	5671356	74274	13080	17.61	285706	86

Birmingham, despite having the fewest impressions, clicks, and engagement, recorded the highest conversion rate (CVR) at 28.29%. On the other hand, campaigns in London had the lowest CVR, even though they achieved the highest numbers in impressions, clicks, and engagement.

-- What is the average CTR and CPC in each city?
SELECT City_Location AS City,
     ROUND(AVG(Daily_Average_CPC), 2) AS Avg_CPC,
     ROUND(AVG (CTR),2) AS Avg_CTR
FROM marketing
GROUP BY City_Location
ORDER BY Avg_CTR DESC;

	City	Avg_CPC	Avg_CTR
1	London	0.9	1.32
2	Manchester	0.91	1.27
3	Birmingham	0.9	1.12

With all cities having the same CPC, London had the highest CTR and Birmingham recording the lowest.

-- ROI based on location.

SELECT City_Location,

    SUM (Spend_GBP) AS Total_spend_GBP,

    SUM (Total_conversion_value_GBP) AS Total_conversion_value_GBP,

    ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI

FROM marketing

GROUP BY City_Location

ORDER BY ROI DESC;

	City_Location	Total_spend_GBP	Total_conversion_value_GBP	ROI
1	Birmingham	39457	550018.959905922	12.94
2	Manchester	57045	649669.869894683	10.39
3	London	66679	532011.429615259	6.98

Birmingham had the best ROI, followed by Manchester. Despite having the most amount spent for campaign, London had the lowest ROI.

--5. Device Performance

-- What device has the highest engagement rates (likes, shares, comments)?
-- What is the conversion rate by device?
```
SELECT Device,
        ROUND(SUM(Impressions),2) AS Total_impressions,
        SUM(Clicks) AS Total_clicks,
        SUM(Conversions) AS Total_conversions,
        ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)) * 100 ,2) AS CVR,
        SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,
        SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates
FROM marketing
GROUP BY Device
ORDER BY CVR DESC;
```

	Device	Total_impressions	Total_clicks	Total_conversions	CVR	Total_Engagement	Engagement_Rates
1	Desktop	5800159.8	88832	21310	23.99	367988	74
2	Mobile	8845289	92766	18942	20.42	433751	87

More campaign ads were viewed on mobile devices, as indicated by the impressions, clicks, and engagement. However, despite this high viewership, the conversion rate (CVR) was lower compared to ads viewed on desktop computers.

-- What is average CPC and CTR by device?
```
SELECT Device,
        ROUND(AVG(Daily_Average_CPC), 2) AS Avg_CPC,
        ROUND(AVG (CTR),2) AS Avg_CTR
FROM marketing
GROUP BY Device
ORDER BY Avg_CTR DESC;
```

	Device	Avg_CPC	Avg_CTR
1	Desktop	0.98	1.47
2	Mobile	0.83	1

Ads viewed on desktop had a higher average CPC and CTR compared to those viewed on a mobile phone.

-- ROI based on device.

SELECT Device,

      SUM (Spend_GBP) AS Total_spend_GBP,

      SUM (Total_conversion_value_GBP) AS Total_conversion_value_GBP,

      ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI

FROM marketing

GROUP BY Device

ORDER BY ROI DESC;

	Device	Total_spend_GBP	Total_conversion_value_GBP	ROI
1	Desktop	86187	949684.239458263	10.02
2	Mobile	76994	782016.019957602	9.16

Ads viewed on desktop had about 100% better ROI compared to those viewed on mobile phones.

--6. Ad-Level Analysis
-- Which specific ads are performing best in terms of engagement and conversions?

SELECT Ad,

     ROUND(SUM(Impressions),2) AS Total_impressions,

     SUM(Clicks) AS Total_clicks,

     SUM(Conversions) AS Total_conversions,

     ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)) * 100 ,2) AS CVR,

     SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,

     SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates

FROM marketing

GROUP BY Ad

ORDER BY CVR DESC;

	Ad	Total_impressions	Total_clicks	Total_conversions	CVR	Total_Engagement	Engagement_Rates
1	Discount	6719121.7	75638	21183	28.01	459629	92
2	Collection	7926327.1	105960	19069	18	342110	69

Impressions and clicks were higher from collection ads as expected. However, ads showing discounts generated better conversions and engagement, and their corresponding rates.

-- What is the average cost-per-click (CPC) and click-through rate (CTR) for each ads?

SELECT Ad,

       ROUND(AVG(Daily_Average_CPC), 2) AS Avg_CPC,

       ROUND(AVG (CTR),2) AS Avg_CTR

FROM marketing

GROUP BY Ad

ORDER BY Avg_CTR DESC;

	Ad	Avg_CPC	Avg_CTR
1	Collection	0.67	1.34
2	Discount	1.14	1.13

Collection ads had higher average CTR and lower average CPC compared to discount ads.

-- ROI based on Ads.

SELECT Ad,

    SUM (Spend_GBP) AS Total_spend_GBP,

    SUM (Total_conversion_value_GBP) AS Total_conversion_value_GBP,

    ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI

FROM marketing

GROUP BY Ad

ORDER BY ROI DESC;

	Ad	Total_spend_GBP	Total_conversion_value_GBP	ROI
1	Discount	91035	1074061.43015152	10.8
2	Collection	72146	657638.829264343	8.12

Discount ads achieved a significantly better ROI, nearly 200% higher than that of collection ads.

--7. Time Series Analysis

-- Monthly
SELECT MONTH(Date) AS Monthly,
            DATENAME (mm, (Date)) AS Month_Names,
            ROUND(SUM(Impressions),2) AS Total_Impressions,
        SUM(Clicks) AS Total_Clicks,
        SUM(Conversions) AS Total_Conversion,
        ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)),2) * 100 AS CVR,
        ROUND(AVG(Daily_Average_CPC), 2) AS Avg_CPC,
        ROUND(AVG (CTR),2) AS Avg_CTR,
        SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,
        SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates,
        SUM (Spend_GBP) AS Total_spend_GBP,
        ROUND(SUM (Total_conversion_value_GBP),2) AS Total_conversion_value_GBP,
     ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI
FROM marketing
GROUP BY MONTH(Date), DATENAME (mm, (Date))
ORDER BY Monthly;

Impressions and clicks were at their lowest during the June to August period, coinciding with Summer campaign. Despite this, conversions during these months were similar to those in other periods, resulting in the highest CVR for June to August. Additionally, the monthly expenditure on campaign ads during this time (approximately £11.5K) was the lowest compared to other months, yet it still produced the highest ROI overall.

In contrast, the spending on campaigns from September to November was the highest, leading to the most impressions, clicks, engagements, and CTR. However, this did not translate into a similar pattern for CVR and ROI, which were recorded as the lowest during these months.

```sql
SET DATEFIRST 7;

SELECT DATEPART(dw, Date) AS campaign_weekday_num,
        DATENAME(dw, Date) AS campaign_weekday,
        ROUND(SUM(Impressions),2) AS Total_Impressions,
        SUM(Clicks) AS Total_Clicks,
        SUM(Conversions) AS Total_Conversion,
        ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)),2) * 100 AS CVR,
        ROUND(AVG(Daily_Average_CPC), 2) AS Avg_CPC,
        ROUND(AVG (CTR),2) AS Avg_CTR,
        SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,
        SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates,
        SUM (Spend_GBP) AS Total_spend_GBP,
        ROUND(SUM (Total_conversion_value_GBP),2) AS Total_conversion_value_GBP,
      ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI
FROM marketing
GROUP BY DATENAME(dw, Date), DATEPART(dw, Date)
ORDER BY campaign_weekday_num;
```

-- **Daily**

```sql
SELECT DAY(Date) AS Daily,
            ROUND(SUM(Impressions),2) AS Total_Impressions,
        SUM(Clicks) AS Total_Clicks,
        SUM(Conversions) AS Total_Conversion,
        ROUND(SUM (Conversions)/SUM(CAST(Clicks AS FLOAT)),2) * 100 AS CVR,
        ROUND(AVG(Daily_Average_CPC), 2) AS Avg_CPC,
        ROUND(AVG (CTR),2) AS Avg_CTR,
        SUM(Likes_Reactions + Shares + Comments) AS Total_Engagement,
        SUM(Likes_Reactions + Shares + Comments)/COUNT(*) AS Engagement_Rates,
        SUM (Spend_GBP) AS Total_spend_GBP,
        ROUND(SUM (Total_conversion_value_GBP),2) AS Total_conversion_value_GBP,
      ROUND(SUM(Total_conversion_value_GBP - Spend_GBP)/SUM(Spend_GBP),2) AS ROI
FROM marketing
GROUP BY DAY(Date)
ORDER BY Daily;
```

No differences was observed on every parameter from Sunday to Saturday. Similarly to weekday, no differences in the total, averages and rates were observed on day-to-day basis.