Operation Analytics and Investigating Metric Spike

Case Study 1: Job Data Analysis

Tasks:

A. Jobs Reviewed Over Time:

Task:

Write an SQL query to calculate the number of jobs reviewed per hour for each day in November 2020.

Code:

```
SELECT * FROM job_data;
SELECT
  AVG(t) AS 'avg_jobs_reviewed_per_day_per_hour',
  AVG(p) AS 'avg_jobs_reviewed_per_day_per_second'
FROM
(
  SELECT
    ds,
    ((COUNT(job_id) * 3600) / SUM(time_spent)) AS t,
    (COUNT(job_id) / SUM(time_spent)) AS p
  FROM
    job_data
  WHERE
    MONTH(ds) = 11
  GROUP BY ds
) a;
```

Output:

avg_jobs_reviewed_per_day_per_hour	avg_jobs_reviewed_per_day_per_second
126.18048333	0.03505000

In the above query, we are figuring out how fast jobs were being reviewed in November by calculating the average number of jobs finished in an hour and a second for each day of the month. So the output for ***avg_jobs_reviewed_per_day_per_hour*** is ***126.18048333*** and ***avg_jobs_reviewed_per_day_per_second*** is ***0.03505000***

B. Throughput Analysis:

Task:

Write an SQL query to calculate the 7-day rolling average of throughput. Also, explain why you prefer using the daily metric or the 7-day rolling average for throughput.

Code:

```
SELECT ROUND(COUNT(event)/SUM(time_spent), 2) AS "Weekly Throughput"
FROM job_data;
SELECT ds AS Dates, ROUND(COUNT(event)/SUM(time_spent), 2) AS "Daily
Throughput" FROM job_data
GROUP BY ds ORDER BY ds;
```

Output:

Dates	Daily Throughput
2020-11-25	0.02
2020-11-26	0.02
2020-11-27	0.01
2020-11-28	0.06
2020-11-29	0.05
2020-11-30	0.05

In the above query, calculate throughput, which measures how many jobs are completed per unit of time. In the first query, we calculate the ***weekly throughput*** by calculating the total number of jobs completed divided by the total time spent on all jobs for an entire week, giving us an output of ***0.03***. In the next query, we calculate the ***daily throughput*** by dividing the number of jobs completed by the total time spent for each day which in turn provides us a daily breakdown of efficiency which is shown in the above output.

C. Language Share Analysis:

Task:

Write an SQL query to calculate the percentage share of each language over the last 30 days.

Code:

```
SELECT language AS Languages, ROUND(100 * COUNT(*)/total, 2) AS
Percentage, sub. total
FROM job_data
CROSS JOIN (SELECT COUNT(*) AS total FROM job_data) AS sub
GROUP BY language, sub. total;
```

Output:

Languages	Percentage	Total
English	12.50	8
Arabic	12.50	8
Persian	37.50	8
Hindi	12.50	8
French	12.50	8
Italian	12.50	8

In task C we have this query which calculates the percentage of jobs completed in each language relative to the total number of jobs. We can achieve this by counting jobs by language by grouping the data and counting the number of jobs in each group. The result is the percentage of jobs completed in each language alongside the total number of jobs.

D. Duplicate Rows Detection:

Task:

Write an SQL query to display duplicate rows from the job_data table.

Code:

```
SELECT actor_id, COUNT(*) AS Duplicates FROM job_data
GROUP BY actor_id HAVING COUNT(*) > 1;
```

Output:

actor_id	Duplicates
1003	2

The above query identifies duplicate records within the job_data table based on the actor_id. Although duplicate values are present in the job_id column also below is the query to identify duplicate values in the job_id column.

Code:

```
SELECT job_id, COUNT(*) AS Duplicates FROM job_data
GROUP BY job_id HAVING COUNT(*) > 1;
```

Output:

job_id	Duplicates
23	3

Case Study 2: Investigating Metric Spike

Tasks

A. Weekly User Engagement:

Task:

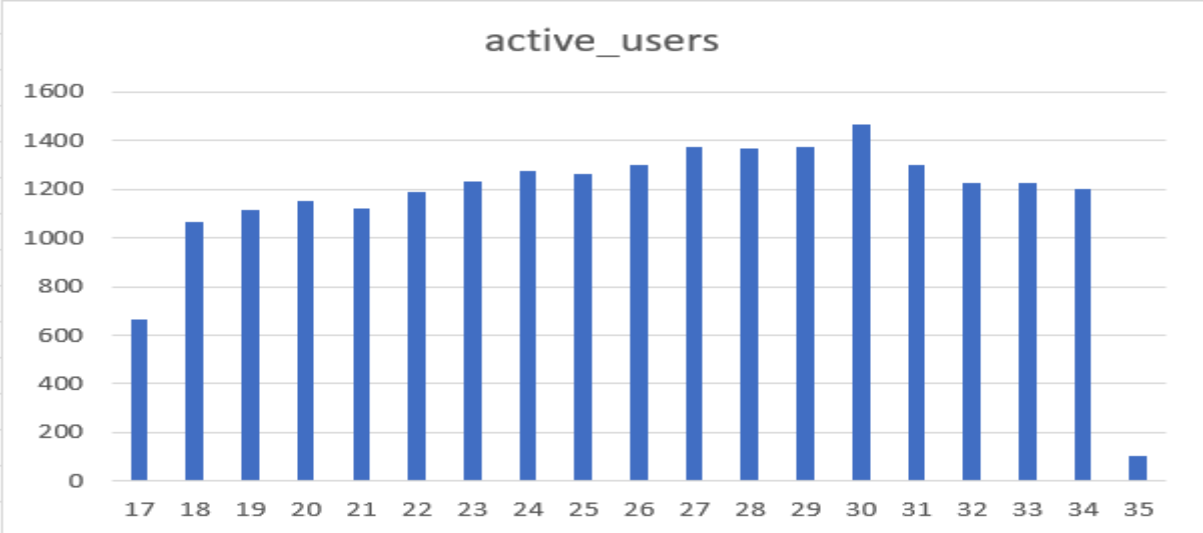
Write an SQL query to calculate the weekly user engagement.

Code:

```
# Viewing the table
    select * from events
#Running the Query
    select extract(week from occurred_at) as week_number,
    count(distinct user_id) as active_user
    from events
    where event_type='engagement'
    group by week_number
```

Output:

week_number	active_users	week_number	active_users
17	663	27	1372
18	1068	28	1365
19	1113	29	1376
20	1154	30	1467
21	1121	31	1299
22	1186	32	1225
23	1232	33	1225
24	1275	34	1204
25	1264	35	104
26	1302		



The provided SQL query calculates the number of unique users engaging with a product weekly. The week where the active users were highest is the ***30th*** week with ***1467*** active users

B. User Growth Analysis:

Task:

Write an SQL query to calculate the user growth for the product.

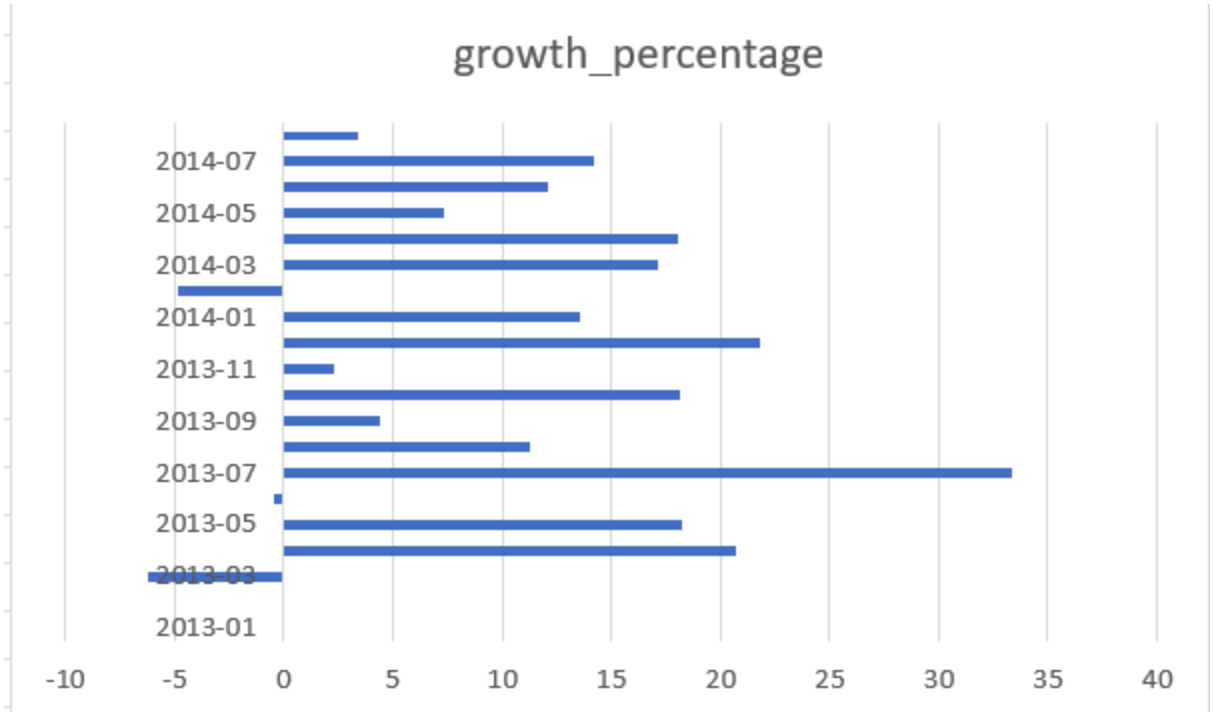
Code:

```
WITH monthly_user_count AS (
  SELECT
    DATE_FORMAT(STR_TO_DATE(created_at, '%d-%m-%Y %H:%i'), '%Y-%m') AS
month,
    COUNT(user_id) AS new_users
  FROM
    users
  GROUP BY
    DATE_FORMAT(STR_TO_DATE(created_at, '%d-%m-%Y %H:%i'), '%Y-%m')
),
growth_calculation AS (
  SELECT
    month,
    new_users,
    LAG(new_users, 1) OVER (ORDER BY month) AS previous_month_users,
    (new_users - LAG(new_users, 1) OVER (ORDER BY month)) AS user_growth,
    (CASE
      WHEN LAG(new_users, 1) OVER (ORDER BY month) = 0 THEN NULL
```

```
            ELSE ROUND((new_users - LAG(new_users, 1) OVER (ORDER BY month)) /
LAG(new_users, 1) OVER (ORDER BY month) * 100, 2)
        END) AS growth_percentage
    FROM
        monthly_user_count
)
SELECT
    month,
    new_users,
    previous_month_users,
    user_growth,
    growth_percentage
FROM
    growth_calculation
ORDER BY
    month;
```

Output:

month	new_users	previous_month_users	users_growth	growth_percentage
2013-01	160	0	0	0
2013-02	160	160	0	0
2013-03	150	160	-10	-6.25
2013-04	181	150	31	20.67
2013-05	214	181	33	18.23
2013-06	213	214	-1	-0.47
2013-07	284	213	71	33.33
2013-08	316	284	32	11.27
2013-09	330	316	14	4.43
2013-10	390	330	60	18.18
2013-11	399	390	9	2.31
2013-12	486	399	87	21.8
2014-01	552	486	66	13.58
2014-02	525	552	-27	-4.89
2014-03	615	525	90	17.14
2014-04	726	615	111	18.05
2014-05	779	726	53	7.3
2014-06	873	779	94	12.07
2014-07	997	873	124	14.2
2014-08	1031	997	34	3.41



We have tried to analyze the user growth in the above SQL query. From the output, we can see that the highest user growth percentage was in ***July 2013*** at ***33.33*** percent, with a user growth 71. But if we observe the user growth column the highest user growth is in July 2014 with 124 user growth. Since we are comparing the present month's user growth with the previous month the highest percentage remains for July 2013 since in the previous month there was a loss of one user.

C. Weekly Retention Analysis:

Task:

Write an SQL query to calculate the weekly retention of users based on their sign-up cohort.

Code:

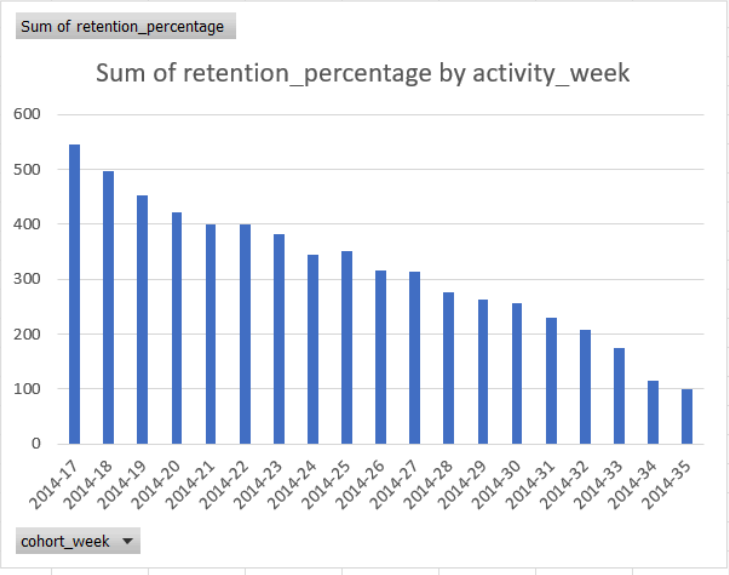
```
WITH user_cohort AS (
  SELECT
    user_id,
    MIN(DATE(occurred_at)) AS signup_date,
    YEARWEEK(MIN(DATE(occurred_at))) AS cohort_week
  FROM
    events
  GROUP BY
    user_id
```

```
),
weekly_engagement AS (
    SELECT
        e.user_id,
        YEARWEEK(DATE(e.occurred_at)) AS activity_week,
        uc.cohort_week
    FROM
        events e
    JOIN
        user_cohort uc ON e.user_id = uc.user_id
),
retention_calculation AS (
    SELECT
        cohort_week,
        activity_week,
        COUNT(DISTINCT user_id) AS active_users,
        COUNT(DISTINCT CASE WHEN activity_week = cohort_week THEN user_id
END) AS new_users
    FROM
        weekly_engagement
    GROUP BY
        cohort_week, activity_week
),
retention_rate AS (
    SELECT
        cohort_week,
        activity_week,
        active_users,
        new_users,
        ROUND((active_users / MAX(new_users) OVER (PARTITION BY cohort_week) *
100), 2) AS retention_percentage
    FROM
        retention_calculation
)
SELECT
    CONCAT(SUBSTRING(cohort_week, 1, 4), '-', SUBSTRING(cohort_week, 5, 2)) AS
cohort_week_formatted,
    CONCAT(SUBSTRING(activity_week, 1, 4), '-', SUBSTRING(activity_week, 5, 2)) AS
activity_week_formatted,
    retention_percentage
FROM
    retention_rate
ORDER BY
    cohort_week, activity_week;
```

Output:

cohort_week	activity_week	retention_percentage	cohort_week	activity_week	retention_percentage	cohort_week	activity_week	retention_percentage
2014-17	2014-17	100	2014-20	2014-28	17.6	2014-25	2014-28	33.11
2014-17	2014-18	71.19	2014-20	2014-29	18.16	2014-25	2014-29	24.59
2014-17	2014-19	48.87	2014-20	2014-30	18.72	2014-25	2014-30	20.66
2014-17	2014-20	37.86	2014-20	2014-31	11.45	2014-25	2014-31	16.39
2014-17	2014-21	30.92	2014-20	2014-32	11.17	2014-25	2014-32	15.08
2014-17	2014-22	28.21	2014-20	2014-33	9.22	2014-25	2014-33	12.46
2014-17	2014-23	25.19	2014-20	2014-34	11.17	2014-25	2014-34	11.48
2014-17	2014-24	22.02	2014-21	2014-21	100	2014-25	2014-35	0.66
2014-17	2014-25	21.87	2014-21	2014-22	58.99	2014-26	2014-26	100
2014-17	2014-26	21.87	2014-21	2014-23	41.32	2014-26	2014-27	62.85
2014-17	2014-27	20.51	2014-21	2014-24	28.71	2014-26	2014-28	39.58
2014-17	2014-28	19.76	2014-21	2014-25	23.34	2014-26	2014-29	28.82
2014-17	2014-29	19.91	2014-21	2014-26	19.87	2014-26	2014-30	25.35
2014-17	2014-30	21.57	2014-21	2014-27	23.66	2014-26	2014-31	19.1
2014-17	2014-31	17.5	2014-21	2014-28	22.71	2014-26	2014-32	16.32
2014-17	2014-32	13.73	2014-21	2014-29	18.3	2014-26	2014-33	14.93
2014-17	2014-33	12.37	2014-21	2014-30	15.14	2014-26	2014-34	10.07
2014-17	2014-34	11.61	2014-21	2014-31	14.2	2014-27	2014-27	100
2014-17	2014-35	0.75	2014-21	2014-32	12.3	2014-27	2014-28	68.15
2014-18	2014-18	100	2014-21	2014-33	11.04	2014-27	2014-29	41.44
2014-18	2014-19	60.74	2014-21	2014-34	8.83	2014-27	2014-30	36.3
2014-18	2014-20	43.79	2014-21	2014-35	0.63	2014-27	2014-31	23.29
2014-18	2014-21	34.06	2014-22	2014-22	100	2014-27	2014-32	18.15
2014-18	2014-22	28.19	2014-22	2014-23	68.71	2014-27	2014-33	13.7
2014-18	2014-23	24.66	2014-22	2014-24	46.01	2014-27	2014-34	12.33
2014-18	2014-24	24.16	2014-22	2014-25	32.82	2014-27	2014-35	0.34
2014-18	2014-25	21.31	2014-22	2014-26	26.69	2014-28	2014-28	100
2014-18	2014-26	18.96	2014-22	2014-27	22.39	2014-28	2014-29	70.8
2014-18	2014-27	20.47	2014-22	2014-28	19.33	2014-28	2014-30	41.61
2014-18	2014-28	17.79	2014-22	2014-29	18.4	2014-28	2014-31	25.18
2014-18	2014-29	19.8	2014-22	2014-30	16.87	2014-28	2014-32	16.79
2014-18	2014-30	21.31	2014-22	2014-31	14.72	2014-28	2014-33	10.95
2014-18	2014-31	18.46	2014-22	2014-32	12.58	2014-28	2014-34	10.22
2014-18	2014-32	16.28	2014-22	2014-33	11.96	2014-28	2014-35	1.09
2014-18	2014-33	14.26	2014-22	2014-34	9.51	2014-29	2014-29	100
2014-18	2014-34	11.24	2014-22	2014-35	0.31	2014-29	2014-30	68.89
2014-18	2014-35	0.67	2014-23	2014-23	100	2014-29	2014-31	37.78
2014-19	2014-19	100	2014-23	2014-24	66.77	2014-29	2014-32	24.07
2014-19	2014-20	66.51	2014-23	2014-25	42.07	2014-29	2014-33	17.41
2014-19	2014-21	40.52	2014-23	2014-26	30.79	2014-29	2014-34	14.81
2014-19	2014-22	35.83	2014-23	2014-27	27.44	2014-29	2014-35	0.37
2014-19	2014-23	26.7	2014-23	2014-28	24.09	2014-30	2014-30	100
2014-19	2014-24	22.25	2014-23	2014-29	21.04	2014-30	2014-31	68.71
2014-19	2014-25	21.31	2014-23	2014-30	18.6	2014-30	2014-32	41.16
2014-19	2014-26	18.97	2014-23	2014-31	16.46	2014-30	2014-33	26.53
2014-19	2014-27	22.25	2014-23	2014-32	14.33	2014-30	2014-34	18.03
2014-19	2014-28	19.2	2014-23	2014-33	10.67	2014-30	2014-35	1.02
2014-19	2014-29	15.93	2014-23	2014-34	9.15	2014-31	2014-31	100
2014-19	2014-30	15.22	2014-24	2014-24	100	2014-31	2014-32	67.44
2014-19	2014-31	14.75	2014-24	2014-25	60.47	2014-31	2014-33	35.35
2014-19	2014-32	9.84	2014-24	2014-26	42.18	2014-31	2014-34	26.51
2014-19	2014-33	11.94	2014-24	2014-27	30.09	2014-31	2014-35	0.47
2014-19	2014-34	11.48	2014-24	2014-28	23.89	2014-32	2014-32	100
2014-19	2014-35	0.47	2014-24	2014-29	18.58	2014-32	2014-33	70.41
2014-20	2014-20	100	2014-24	2014-30	19.17	2014-32	2014-34	35.21
2014-20	2014-21	62.29	2014-24	2014-31	17.99	2014-32	2014-35	3
2014-20	2014-22	46.09	2014-24	2014-32	11.21	2014-33	2014-33	100
2014-20	2014-23	33.8	2014-24	2014-33	11.5	2014-33	2014-34	70.63
2014-20	2014-24	25.42	2014-24	2014-34	8.55	2014-33	2014-35	3.15
2014-20	2014-25	20.11	2014-25	2014-25	100	2014-34	2014-34	100
2014-20	2014-26	17.6	2014-25	2014-26	71.48	2014-34	2014-35	15.77
2014-20	2014-27	18.72	2014-25	2014-27	45.57	2014-35	2014-35	100

cohort_week	Sum of retention_percentage
2014-17	545.71
2014-18	496.15
2014-19	453.17
2014-20	421.52
2014-21	399.04
2014-22	400.3
2014-23	381.41
2014-24	343.63
2014-25	351.48
2014-26	317.02
2014-27	313.7
2014-28	276.64
2014-29	263.33
2014-30	255.45
2014-31	229.77
2014-32	208.62
2014-33	173.78
2014-34	115.77
2014-35	100



We have tried to calculate the weekly retention of users based on their sign-up cohort. As per the output 2014-17 had the highest retention rate with 545.71% as it was the starting cohort week further we can see the dip of retention percentage up to 100 at week 2014-35.

D. Weekly Engagement Per Device:

Task:

Write an SQL query to calculate the weekly engagement per device.

Code:

```
SELECT
   DATE_FORMAT(occurred_at, '%Y-%u') AS week,
   device,
   COUNT(*) AS engagement_count
FROM
   events
GROUP BY
   week, device
ORDER BY
   week, engagement_count DESC;
```

Output:

In the above query, we have extracted the year and week from the date format. used the device to group the devices, the count of the number of events per week per device is represented as the engagement. We have performed group by on both device and week and order by on week and engagement_count in descending order. By analyzing the data we know that the MacBook Pro has the highest engagement count and the Amazon Fire phone with lowest engagement count.

week	device	engagement_count	week	device	engagement_count	week	device	engagement_count	week	device	engagement_count
2014-18	macbook pro	1705	2014-22	ipad air	437	2014-27	macbook pro	3300	2014-31	asus chromebook	494
2014-18	lenovo thinkpad	858	2014-22	kindle fire	358	2014-27	lenovo thinkpad	2173	2014-31	hp pavilion desktop	439
2014-18	iphone 5	774	2014-22	ipad mini	319	2014-27	iphone 5	1673	2014-31	acer aspire desktop	408
2014-18	dell inspiron	569	2014-22	acer aspire desktop	318	2014-27	macbook air	1499	2014-31	ipad mini	389
2014-18	macbook air	538	2014-22	mac mini	288	2014-27	samsung galaxy s4	1141	2014-31	nokia lumia 635	354
2014-18	samsung galaxy s4	519	2014-22	nexus 10	264	2014-27	dell inspiron notebook	1073	2014-31	nexus 10	327
2014-18	iphone 5s	512	2014-22	htc one	258	2014-27	iphone 5s	1060	2014-31	mac mini	320
2014-18	nexus 5	452	2014-22	nexus 7	217	2014-27	nexus 5	928	2014-31	htc one	301
2014-18	ipad air	358	2014-22	samsung galaxy note	202	2014-27	dell inspiron desktop	642	2014-31	kindle fire	239
2014-18	asus chromebook	286	2014-22	nokia lumia 635	201	2014-27	asus chromebook	609	2014-31	amazon fire phone	185
2014-18	ipad mini	229	2014-22	windows surface	186	2014-27	ipad air	573	2014-31	windows surface	182
2014-18	iphone 4s	219	2014-22	samsumg galaxy	66	2014-27	hp pavilion desktop	537	2014-31	samsung galaxy note	145
2014-18	acer aspire notebook	215	2014-22	amazon fire phone	26	2014-27	iphone 4s	470	2014-31	samsumg galaxy	142
2014-18	dell inspiron desktop	198	2014-23	macbook pro	3190	2014-27	nokia lumia 635	463	2014-32	macbook pro	3660
2014-18	htc one	192	2014-23	lenovo thinkpad	1795	2014-27	ipad mini	463	2014-32	lenovo thinkpad	2057
2014-18	nexus 7	185	2014-23	macbook air	1774	2014-27	nexus 7	438	2014-32	macbook air	1563
2014-18	nexus 10	145	2014-23	iphone 5	1369	2014-27	acer aspire notebook	327	2014-32	iphone 5	1503
2014-18	hp pavilion desktop	141	2014-23	nexus 5	1184	2014-27	acer aspire desktop	308	2014-32	dell inspiron	1262
2014-18	nokia lumia 635	137	2014-23	dell inspiron	1120	2014-27	kindle fire	277	2014-32	samsung galaxy s4	1094
2014-18	samsung galaxy note	117	2014-23	samsung galaxy s4	1040	2014-27	nexus 10	269	2014-32	iphone 5s	691
2014-18	windows surface	87	2014-23	iphone 5s	942	2014-27	htc one	226	2014-32	nexus 5	682
2014-18	amazon fire phone	84	2014-23	dell inspiron desktop	752	2014-27	windows surface	210	2014-32	asus chromebook	677
2014-18	samsumg galaxy	71	2014-23	asus chromebook	639	2014-27	amazon fire phone	137	2014-32	hp pavilion desktop	621
2014-18	acer aspire desktop	71	2014-23	ipad air	600	2014-27	mac mini	134	2014-32	ipad air	574
2014-18	kindle fire	64	2014-23	iphone 4s	455	2014-27	samsumg galaxy tablet	127	2014-32	iphone 4s	567
2014-18	mac mini	64	2014-23	nexus 7	438	2014-27	samsung galaxy note	101	2014-32	acer aspire notebook	554
2014-19	macbook pro	3405	2014-23	acer aspire notebook	407	2014-28	macbook pro	3559	2014-32	nexus 7	434
2014-19	lenovo thinkpad	1828	2014-23	hp pavilion desktop	380	2014-28	lenovo thinkpad	2263	2014-32	dell inspiron desktop	432
2014-19	macbook air	1643	2014-23	nexus 10	340	2014-28	iphone 5	1866	2014-32	acer aspire desktop	370
2014-19	iphone 5	1336	2014-23	htc one	325	2014-28	macbook air	1648	2014-32	nokia lumia 635	333
2014-19	samsung galaxy s4	1092	2014-23	ipad mini	319	2014-28	samsung galaxy s4	1191	2014-32	nexus 10	235
2014-19	nexus 5	937	2014-23	nokia lumia 635	310	2014-28	nexus 5	1050	2014-32	mac mini	233
2014-19	dell inspiron	931	2014-23	samsung galaxy note	285	2014-28	dell inspiron notebook	1014	2014-32	ipad mini	213
2014-19	iphone 5s	809	2014-23	mac mini	282	2014-28	iphone 5s	940	2014-32	windows surface	206
2014-19	dell inspiron desktop	700	2014-23	kindle fire	279	2014-28	iphone 4s	759	2014-32	amazon fire phone	147
2014-19	ipad air	537	2014-23	acer aspire desktop	261	2014-28	acer aspire notebook	605	2014-32	kindle fire	131
2014-19	iphone 4s	509	2014-23	windows surface	190	2014-28	hp pavilion desktop	596	2014-32	htc one	113
2014-19	asus chromebook	498	2014-23	samsumg galaxy	81	2014-28	dell inspiron desktop	569	2014-32	samsung galaxy note	100
2014-19	acer aspire notebook	386	2014-23	amazon fire phone	48	2014-28	asus chromebook	528	2014-32	samsumg galaxy	78
2014-19	nexus 10	372	2014-24	macbook pro	3059	2014-28	ipad air	509	2014-33	macbook pro	3366
2014-19	hp pavilion desktop	372	2014-24	lenovo thinkpad	1904	2014-28	nexus 7	386	2014-33	lenovo thinkpad	1980
2014-19	nokia lumia 635	347	2014-24	iphone 5	1760	2014-28	ipad mini	350	2014-33	iphone 5	1314
2014-19	acer aspire desktop	300	2014-24	macbook air	1468	2014-28	nexus 10	327	2014-33	macbook air	1307
2014-19	ipad mini	296	2014-24	samsung galaxy s4	1059	2014-28	acer aspire desktop	326	2014-33	dell inspiron	1215
2014-19	nexus 7	274	2014-24	nexus 5	1019	2014-28	nokia lumia 635	306	2014-33	samsung galaxy s4	831
2014-19	kindle fire	266	2014-24	dell inspiron	958	2014-28	windows surface	305	2014-33	iphone 5s	724
2014-19	amazon fire phone	179	2014-24	iphone 5s	890	2014-28	kindle fire	268	2014-33	nexus 5	682
2014-19	htc one	176	2014-24	asus chromebook	704	2014-28	htc one	242	2014-33	acer aspire notebook	604
2014-19	mac mini	156	2014-24	hp pavilion desktop	694	2014-28	mac mini	177	2014-33	asus chromebook	590
2014-19	samsung galaxy note	143	2014-24	dell inspiron desktop	537	2014-28	samsumg galaxy tablet	165	2014-33	hp pavilion desktop	575
2014-19	windows surface	121	2014-24	nexus 10	513	2014-28	samsung galaxy note	130	2014-33	dell inspiron desktop	558
2014-19	samsumg galaxy	79	2014-24	iphone 4s	482	2014-28	amazon fire phone	109	2014-33	ipad air	442
2014-20	macbook pro	3076	2014-24	acer aspire notebook	474	2014-29	macbook pro	3498	2014-33	acer aspire desktop	377
2014-20	lenovo thinkpad	2073	2014-24	ipad air	422	2014-29	lenovo thinkpad	2616	2014-33	nexus 10	353
2014-20	macbook air	1312	2014-24	kindle fire	322	2014-29	macbook air	1674	2014-33	iphone 4s	346
2014-20	dell inspiron	1197	2014-24	nexus 7	313	2014-29	iphone 5	1643	2014-33	nokia lumia 635	326
2014-20	iphone 5	1190	2014-24	nokia lumia 635	301	2014-29	samsung galaxy s4	1309	2014-33	ipad mini	270
2014-20	samsung galaxy s4	1046	2014-24	ipad mini	262	2014-29	dell inspiron notebook	1172	2014-33	nexus 7	212
2014-20	iphone 5s	986	2014-24	acer aspire desktop	258	2014-29	iphone 5s	1041	2014-33	amazon fire phone	163
2014-20	nexus 5	969	2014-24	htc one	243	2014-29	nexus 5	894	2014-33	htc one	149
2014-20	ipad air	602	2014-24	amazon fire phone	193	2014-29	iphone 4s	770	2014-33	mac mini	127
2014-20	iphone 4s	506	2014-24	windows surface	191	2014-29	dell inspiron desktop	736	2014-33	samsung galaxy note	114
2014-20	dell inspiron desktop	426	2014-24	mac mini	162	2014-29	hp pavilion desktop	636	2014-33	windows surface	86
2014-20	acer aspire notebook	399	2014-24	samsung galaxy note	153	2014-29	acer aspire notebook	590	2014-33	samsumg galaxy	80
2014-20	hp pavilion desktop	390	2014-24	samsumg galaxy	90	2014-29	ipad air	557	2014-33	kindle fire	71
2014-20	ipad mini	386	2014-25	macbook pro	3081	2014-29	asus chromebook	547	2014-34	macbook pro	3240
2014-20	nexus 7	356	2014-25	lenovo thinkpad	1854	2014-29	nokia lumia 635	438	2014-34	lenovo thinkpad	2160
2014-20	htc one	307	2014-25	macbook air	1697	2014-29	mac mini	381	2014-34	macbook air	1660
2014-20	asus chromebook	286	2014-25	iphone 5	1520	2014-29	ipad mini	365	2014-34	iphone 5	1197
2014-20	mac mini	260	2014-25	nexus 5	1156	2014-29	nexus 7	348	2014-34	dell inspiron	1086
2014-20	kindle fire	257	2014-25	dell inspiron	1101	2014-29	kindle fire	329	2014-34	iphone 5s	755
2014-20	acer aspire desktop	252	2014-25	samsung galaxy s4	963	2014-29	windows surface	309	2014-34	samsung galaxy s4	726
2014-20	nexus 10	235	2014-25	iphone 5s	950	2014-29	htc one	304	2014-34	nexus 5	655
2014-20	nokia lumia 635	215	2014-25	hp pavilion desktop	732	2014-29	acer aspire desktop	268	2014-34	asus chromebook	616
2014-20	windows surface	172	2014-25	dell inspiron desktop	682	2014-29	nexus 10	255	2014-34	acer aspire notebook	482
2014-20	amazon fire phone	149	2014-25	ipad air	633	2014-29	samsung galaxy note	120	2014-34	dell inspiron desktop	398
2014-20	samsung galaxy note	120	2014-25	iphone 4s	606	2014-29	samsumg galaxy tablet	86	2014-34	ipad air	385

2014-20	samsumg galaxy	66	2014-25	acer aspire notebook	526	2014-29	amazon fire phone	52	2014-34	iphone 4s	367
2014-21	macbook pro	3144	2014-25	nokia lumia 635	455	2014-30	macbook pro	3184	2014-34	acer aspire desktop	362
2014-21	lenovo thinkpad	2291	2014-25	asus chromebook	442	2014-30	lenovo thinkpad	2449	2014-34	hp pavilion desktop	355
2014-21	macbook air	1498	2014-25	nexus 7	431	2014-30	macbook air	1749	2014-34	mac mini	338
2014-21	iphone 5	1334	2014-25	nexus 10	373	2014-30	iphone 5	1609	2014-34	ipad mini	268
2014-21	nexus 5	1254	2014-25	ipad mini	315	2014-30	samsung galaxy s4	1408	2014-34	nexus 7	267
2014-21	samsung galaxy s4	1028	2014-25	mac mini	306	2014-30	dell inspiron notebook	1218	2014-34	nokia lumia 635	210
2014-21	dell inspiron	998	2014-25	acer aspire desktop	279	2014-30	iphone 5s	969	2014-34	htc one	152
2014-21	iphone 5s	994	2014-25	kindle fire	240	2014-30	nexus 5	867	2014-34	nexus 10	148
2014-21	iphone 4s	613	2014-25	samsung galaxy note	236	2014-30	hp pavilion desktop	751	2014-34	samsung galaxy note	131
2014-21	ipad air	585	2014-25	windows surface	227	2014-30	iphone 4s	653	2014-34	windows surface	130
2014-21	dell inspiron desktop	516	2014-25	amazon fire phone	145	2014-30	ipad air	614	2014-34	kindle fire	124
2014-21	acer aspire notebook	487	2014-25	htc one	144	2014-30	dell inspiron desktop	570	2014-34	amazon fire phone	117
2014-21	asus chromebook	467	2014-25	samsumg galaxy	104	2014-30	asus chromebook	570	2014-34	samsumg galaxy	88
2014-21	nexus 7	346	2014-26	macbook pro	3054	2014-30	acer aspire notebook	539	2014-35	macbook pro	3179
2014-21	htc one	341	2014-26	lenovo thinkpad	2176	2014-30	nokia lumia 635	440	2014-35	lenovo thinkpad	1956
2014-21	hp pavilion desktop	302	2014-26	iphone 5	1639	2014-30	nexus 7	411	2014-35	macbook air	1446
2014-21	mac mini	270	2014-26	macbook air	1309	2014-30	ipad mini	374	2014-35	dell inspiron	1087
2014-21	ipad mini	261	2014-26	dell inspiron	1233	2014-30	kindle fire	296	2014-35	iphone 5	957
2014-21	acer aspire desktop	228	2014-26	samsung galaxy s4	1135	2014-30	mac mini	293	2014-35	samsung galaxy s4	896
2014-21	nexus 10	226	2014-26	iphone 5s	989	2014-30	windows surface	270	2014-35	nexus 5	791
2014-21	kindle fire	211	2014-26	nexus 5	935	2014-30	nexus 10	263	2014-35	iphone 5s	707
2014-21	windows surface	174	2014-26	dell inspiron desktop	682	2014-30	htc one	242	2014-35	acer aspire notebook	594
2014-21	samsung galaxy note	168	2014-26	ipad air	646	2014-30	acer aspire desktop	231	2014-35	asus chromebook	563
2014-21	nokia lumia 635	149	2014-26	acer aspire notebook	599	2014-30	samsung galaxy note	175	2014-35	iphone 4s	503
2014-21	amazon fire phone	104	2014-26	hp pavilion desktop	552	2014-30	samsumg galaxy tablet	121	2014-35	dell inspiron desktop	452
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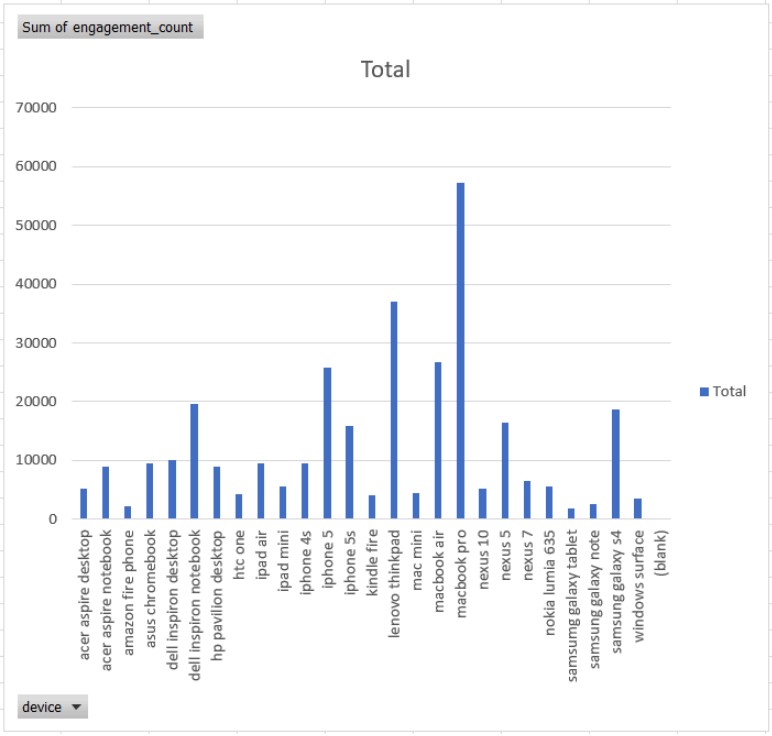
2014-22	macbook pro	3011	2014-26	iphone 4s	481	2014-31	macbook pro	3584	2014-35	hp pavilion desktop	359
2014-22	lenovo thinkpad	1897	2014-26	nokia lumia 635	475	2014-31	lenovo thinkpad	2648	2014-35	nexus 7	343
2014-22	iphone 5	1627	2014-26	asus chromebook	461	2014-31	macbook air	1731	2014-35	ipad air	296
2014-22	macbook air	1270	2014-26	acer aspire desktop	278	2014-31	iphone 5	1572	2014-35	htc one	285
2014-22	nexus 5	1087	2014-26	htc one	276	2014-31	dell inspiron notebook	1483	2014-35	acer aspire desktop	278
2014-22	samsung galaxy s4	974	2014-26	nexus 10	273	2014-31	samsung galaxy s4	1201	2014-35	ipad mini	267
2014-22	dell inspiron	952	2014-26	ipad mini	245	2014-31	iphone 5s	1180	2014-35	nexus 10	221
2014-22	iphone 5s	790	2014-26	mac mini	243	2014-31	nexus 5	960	2014-35	windows surface	197
2014-22	dell inspiron desktop	582	2014-26	windows surface	208	2014-31	iphone 4s	754	2014-35	kindle fire	152
2014-22	asus chromebook	565	2014-26	kindle fire	206	2014-31	dell inspiron desktop	709	2014-35	nokia lumia 635	152
2014-22	iphone 4s	555	2014-26	samsumg galaxy	172	2014-31	ipad air	699	2014-35	samsumg galaxy	117
2014-22	acer aspire notebook	480	2014-26	samsung galaxy note	134	2014-31	acer aspire notebook	662	2014-35	amazon fire phone	111
2014-22	hp pavilion desktop	449	2014-26	amazon fire phone	125	2014-31	nexus 7	598	2014-35	samsung galaxy note	103

Row Labels	Sum of engagement_count
acer aspire desktop	5173
acer aspire notebook	8930
amazon fire phone	2168
asus chromebook	9542
dell inspiron desktop	10141
dell inspiron notebook	19669
hp pavilion desktop	8881
htc one	4276
ipad air	9469
ipad mini	5591
iphone 4s	9615
iphone 5	25883
iphone 5s	15929
kindle fire	4090
lenovo thinkpad	36978
mac mini	4454
macbook air	26786
macbook pro	57295
nexus 10	5139
nexus 5	16502
nexus 7	6540
nokia lumia 635	5612
samsumg galaxy tablet	1811
samsung galaxy note	2677
samsung galaxy s4	18653
windows surface	3451
(blank)	
Grand Total	**325255**



E. Weekly Engagement Per Device:

Task:

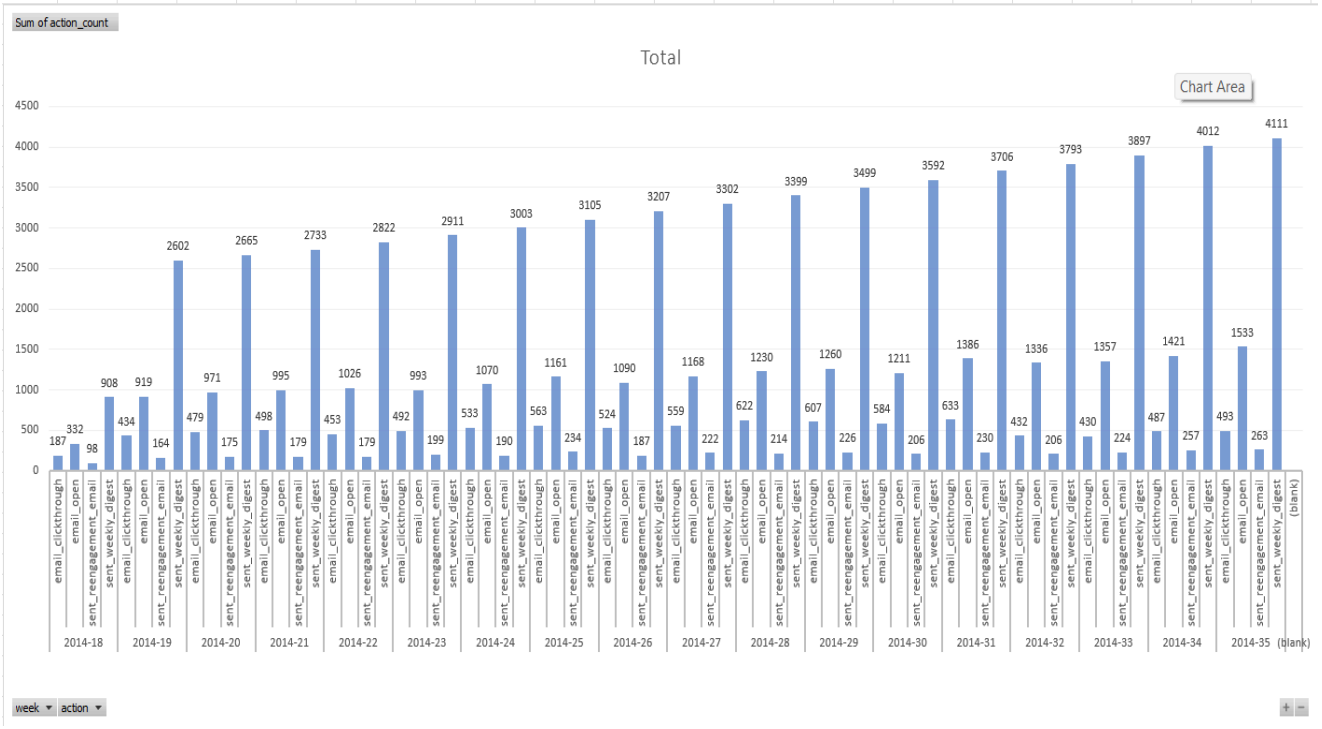
Write an SQL query to calculate the email engagement metrics.

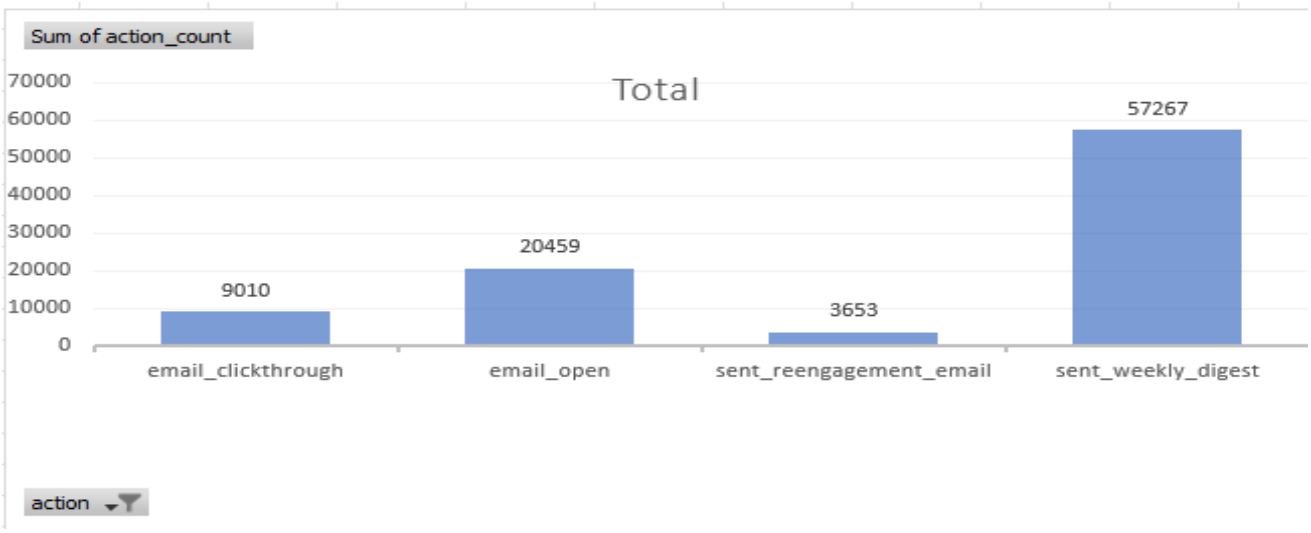
Code:

```
SELECT
   DATE_FORMAT(occurred_at, '%Y-%u') AS week,
   action,
   COUNT(*) AS action_count
FROM
   emailEvents
GROUP BY
   week, action
ORDER BY
   week, action_count DESC;
```

Output:

week	action	action_count	week	action	action_count
2014-18	sent_weekly_digest	908	2014-27	sent_weekly_digest	3302
2014-18	email_open	332	2014-27	email_open	1168
2014-18	email_clickthrough	187	2014-27	email_clickthrough	559
2014-18	sent_reengagement_email	98	2014-27	sent_reengagement_email	222
2014-19	sent_weekly_digest	2602	2014-28	sent_weekly_digest	3399
2014-19	email_open	919	2014-28	email_open	1230
2014-19	email_clickthrough	434	2014-28	email_clickthrough	622
2014-19	sent_reengagement_email	164	2014-28	sent_reengagement_email	214
2014-20	sent_weekly_digest	2665	2014-29	sent_weekly_digest	3499
2014-20	email_open	971	2014-29	email_open	1260
2014-20	email_clickthrough	479	2014-29	email_clickthrough	607
2014-20	sent_reengagement_email	175	2014-29	sent_reengagement_email	226
2014-21	sent_weekly_digest	2733	2014-30	sent_weekly_digest	3592
2014-21	email_open	995	2014-30	email_open	1211
2014-21	email_clickthrough	498	2014-30	email_clickthrough	584
2014-21	sent_reengagement_email	179	2014-30	sent_reengagement_email	206
2014-22	sent_weekly_digest	2822	2014-31	sent_weekly_digest	3706
2014-22	email_open	1026	2014-31	email_open	1386
2014-22	email_clickthrough	453	2014-31	email_clickthrough	633
2014-22	sent_reengagement_email	179	2014-31	sent_reengagement_email	230
2014-23	sent_weekly_digest	2911	2014-32	sent_weekly_digest	3793
2014-23	email_open	993	2014-32	email_open	1336
2014-23	email_clickthrough	492	2014-32	email_clickthrough	432
2014-23	sent_reengagement_email	199	2014-32	sent_reengagement_email	206
2014-24	sent_weekly_digest	3003	2014-33	sent_weekly_digest	3897
2014-24	email_open	1070	2014-33	email_open	1357
2014-24	email_clickthrough	533	2014-33	email_clickthrough	430
2014-24	sent_reengagement_email	190	2014-33	sent_reengagement_email	224
2014-25	sent_weekly_digest	3105	2014-34	sent_weekly_digest	4012
2014-25	email_open	1161	2014-34	email_open	1421
2014-25	email_clickthrough	563	2014-34	email_clickthrough	487
2014-25	sent_reengagement_email	234	2014-34	sent_reengagement_email	257
2014-26	sent_weekly_digest	3207	2014-35	sent_weekly_digest	4111
2014-26	email_open	1090	2014-35	email_open	1533
2014-26	email_clickthrough	524	2014-35	email_clickthrough	493
2014-26	sent_reengagement_email	187	2014-35	sent_reengagement_email	263





In this task, we calculated email engagement metrics, so in the above query we have tried to create a new column called action_count This counts the number of occurrences for each action type per week. We have grouped the output by week and action and performed order by week and action_count in descending order. where sent_weekly_digest is the highest action done with 57267 actions and sent_reengagement_email is the lowest with 3653 actions.