Calculating Churn Rates for subscriptions : 2 user segments

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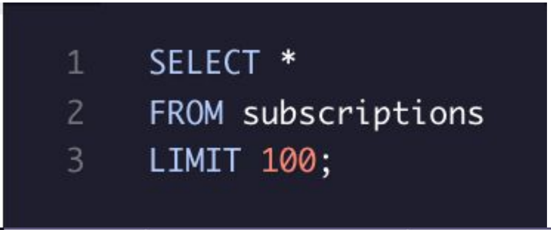
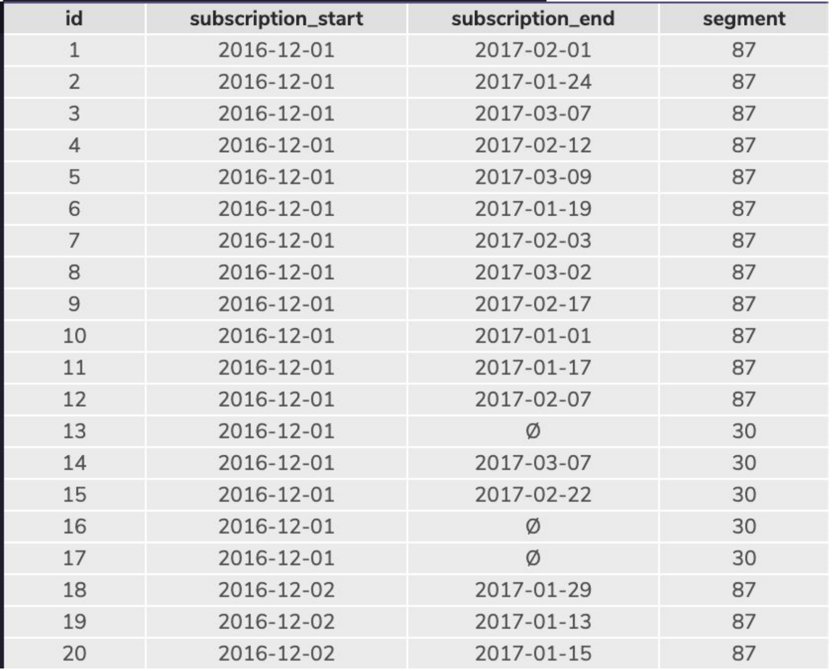
(Fictional Data / Codecademy project)

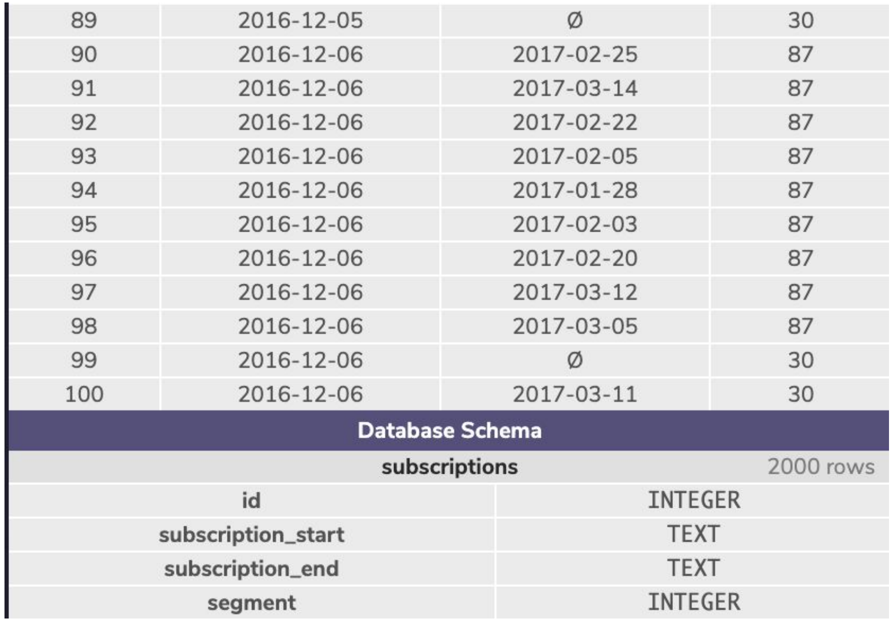
Here we are getting familiar with the table but still limiting the query to give us 100 rows back as we are still getting a feel for the rows, columns and values.



```sql
SELECT *
FROM subscriptions
LIMIT 100;
```



id	subscription_start	subscription_end	segment
1	2016-12-01	2017-02-01	87
2	2016-12-01	2017-01-24	87
3	2016-12-01	2017-03-07	87
4	2016-12-01	2017-02-12	87
5	2016-12-01	2017-03-09	87
6	2016-12-01	2017-01-19	87
7	2016-12-01	2017-02-03	87
8	2016-12-01	2017-03-02	87
9	2016-12-01	2017-02-17	87
10	2016-12-01	2017-01-01	87
11	2016-12-01	2017-01-17	87
12	2016-12-01	2017-02-07	87
13	2016-12-01	Ø	30
14	2016-12-01	2017-03-07	30
15	2016-12-01	2017-02-22	30
16	2016-12-01	Ø	30
17	2016-12-01	Ø	30
18	2016-12-02	2017-01-29	87
19	2016-12-02	2017-01-13	87
20	2016-12-02	2017-01-15	87

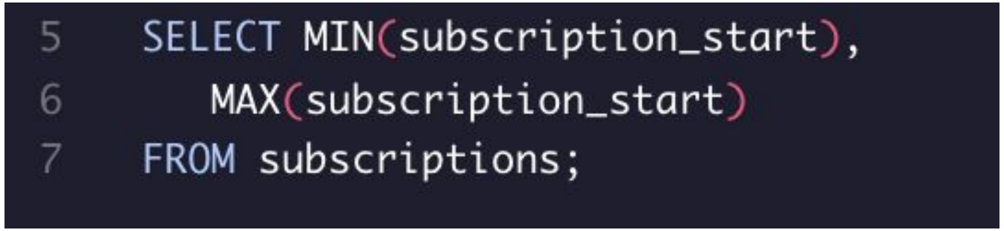


89	2016-12-05	Ø	30
90	2016-12-06	2017-02-25	87
91	2016-12-06	2017-03-14	87
92	2016-12-06	2017-02-22	87
93	2016-12-06	2017-02-05	87
94	2016-12-06	2017-01-28	87
95	2016-12-06	2017-02-03	87
96	2016-12-06	2017-02-20	87
97	2016-12-06	2017-03-12	87
98	2016-12-06	2017-03-05	87
99	2016-12-06	Ø	30
100	2016-12-06	2017-03-11	30

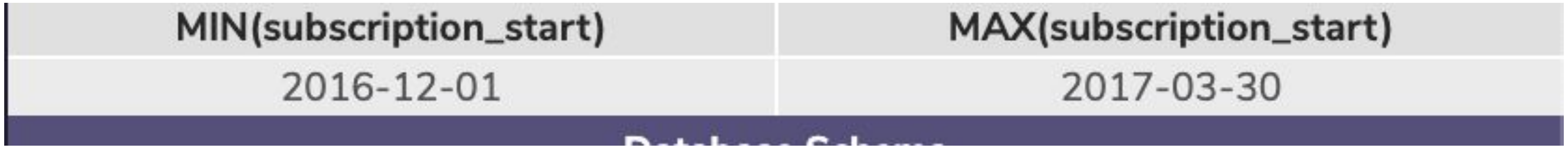
Database Schema

subscriptions	2000 rows
id	INTEGER
subscription_start	TEXT
subscription_end	TEXT
segment	INTEGER

This will show us the range of months of data in the table by asking for the earliest start date recorded and latest start date recorded. We can use these months to calculate for churn because the values in the table will only be from 2016-12-01 through 2017-03-30

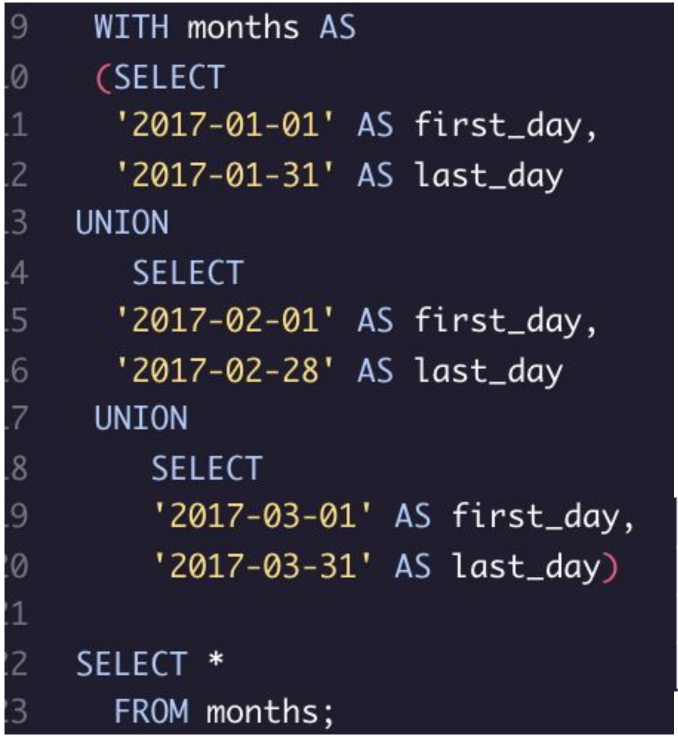


```
SELECT MIN(subscription_start),
   MAX(subscription_start)
FROM subscriptions;
```

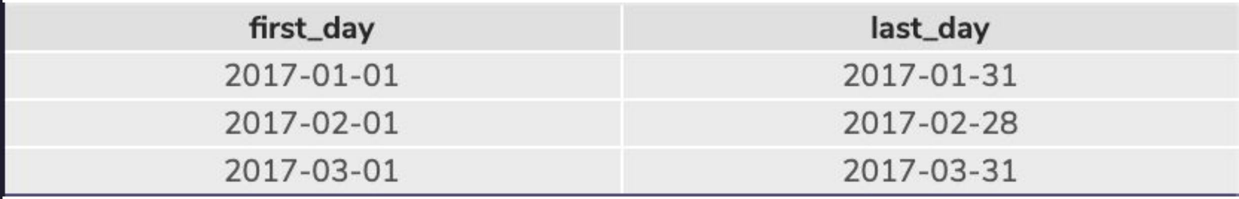


MIN(subscription_start)	MAX(subscription_start)
2016-12-01	2017-03-30

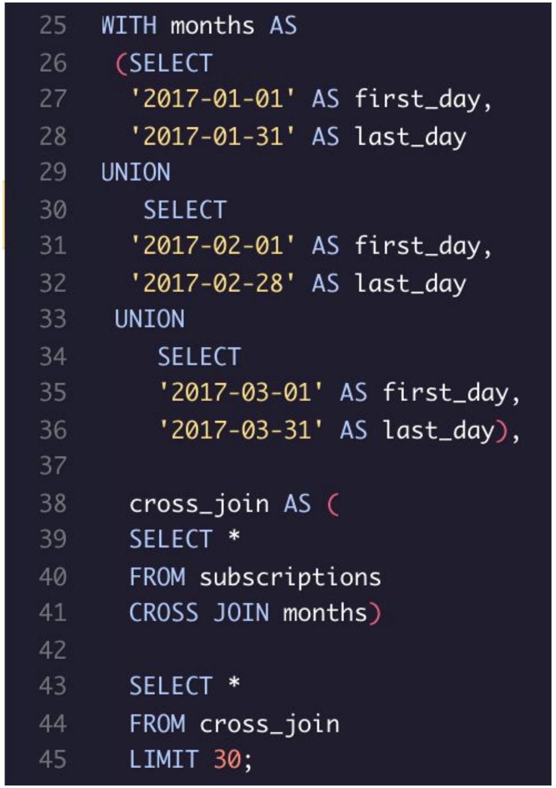
Here we are creating a temporary table of months that make up the first 3 months of 2017. We do not include December in this temporary table because the month of December does not have subscription end dates since a user can not start and end a subscription on the same month. We will need this first to begin calculating the churn rate for the two segments listed as 87 and 30.



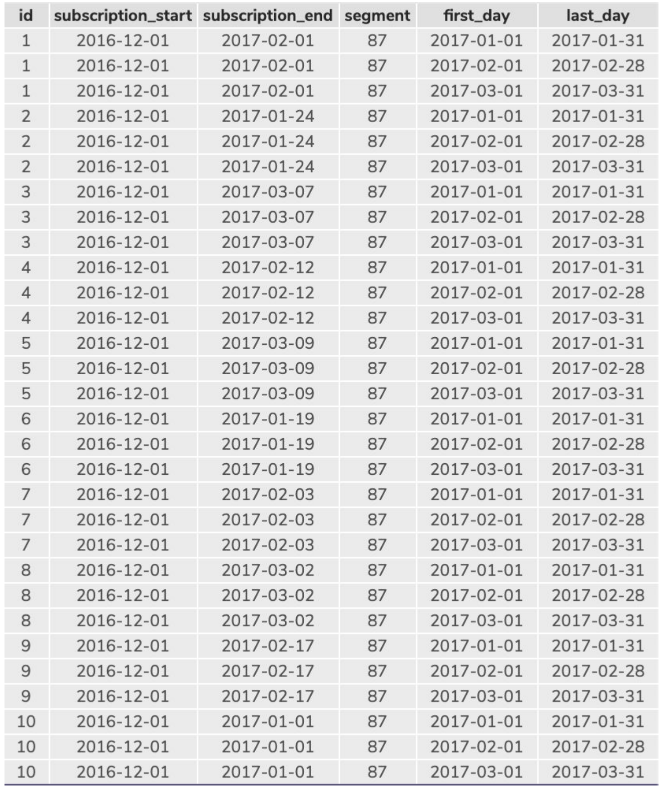
```
  WITH months AS
  (SELECT
   '2017-01-01' AS first_day,
   '2017-01-31' AS last_day
 UNION
    SELECT
   '2017-02-01' AS first_day,
   '2017-02-28' AS last_day
  UNION
     SELECT
     '2017-03-01' AS first_day,
     '2017-03-31' AS last_day)

 SELECT *
   FROM months;
```



first_day	last_day
2017-01-01	2017-01-31
2017-02-01	2017-02-28
2017-03-01	2017-03-31

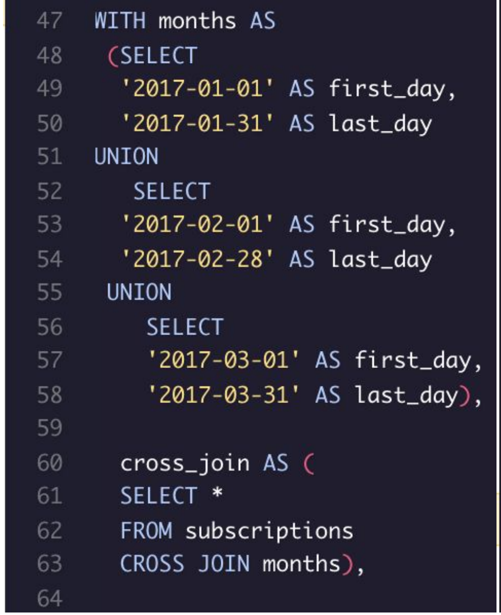


```
WITH months AS
 (SELECT
  '2017-01-01' AS first_day,
  '2017-01-31' AS last_day
UNION
   SELECT
  '2017-02-01' AS first_day,
  '2017-02-28' AS last_day
 UNION
    SELECT
    '2017-03-01' AS first_day,
    '2017-03-31' AS last_day),

  cross_join AS (
  SELECT *
  FROM subscriptions
  CROSS JOIN months)

  SELECT *
  FROM cross_join
  LIMIT 30;
```

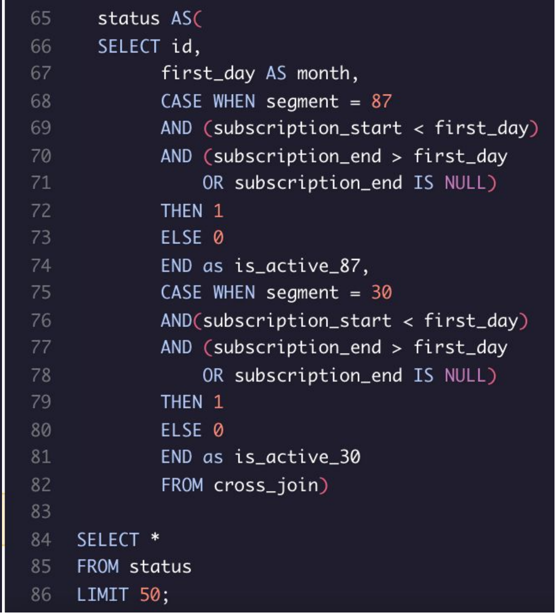


id	subscription_start	subscription_end	segment	first_day	last_day
1	2016-12-01	2017-02-01	87	2017-01-01	2017-01-31
1	2016-12-01	2017-02-01	87	2017-02-01	2017-02-28
1	2016-12-01	2017-02-01	87	2017-03-01	2017-03-31
2	2016-12-01	2017-01-24	87	2017-01-01	2017-01-31
2	2016-12-01	2017-01-24	87	2017-02-01	2017-02-28
2	2016-12-01	2017-01-24	87	2017-03-01	2017-03-31
3	2016-12-01	2017-03-07	87	2017-01-01	2017-01-31
3	2016-12-01	2017-03-07	87	2017-02-01	2017-02-28
3	2016-12-01	2017-03-07	87	2017-03-01	2017-03-31
4	2016-12-01	2017-02-12	87	2017-01-01	2017-01-31
4	2016-12-01	2017-02-12	87	2017-02-01	2017-02-28
4	2016-12-01	2017-02-12	87	2017-03-01	2017-03-31
5	2016-12-01	2017-03-09	87	2017-01-01	2017-01-31
5	2016-12-01	2017-03-09	87	2017-02-01	2017-02-28
5	2016-12-01	2017-03-09	87	2017-03-01	2017-03-31
6	2016-12-01	2017-01-19	87	2017-01-01	2017-01-31
6	2016-12-01	2017-01-19	87	2017-02-01	2017-02-28
6	2016-12-01	2017-01-19	87	2017-03-01	2017-03-31
7	2016-12-01	2017-02-03	87	2017-01-01	2017-01-31
7	2016-12-01	2017-02-03	87	2017-02-01	2017-02-28
7	2016-12-01	2017-02-03	87	2017-03-01	2017-03-31
8	2016-12-01	2017-03-02	87	2017-01-01	2017-01-31
8	2016-12-01	2017-03-02	87	2017-02-01	2017-02-28
8	2016-12-01	2017-03-02	87	2017-03-01	2017-03-31
9	2016-12-01	2017-02-17	87	2017-01-01	2017-01-31
9	2016-12-01	2017-02-17	87	2017-02-01	2017-02-28
9	2016-12-01	2017-02-17	87	2017-03-01	2017-03-31
10	2016-12-01	2017-01-01	87	2017-01-01	2017-01-31
10	2016-12-01	2017-01-01	87	2017-02-01	2017-02-28
10	2016-12-01	2017-01-01	87	2017-03-01	2017-03-31

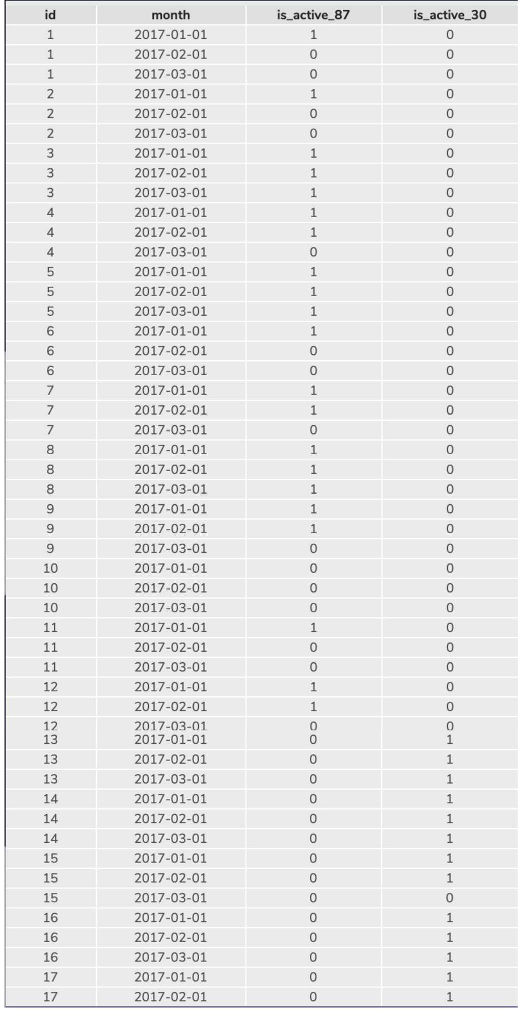
This syntax will join the results for the temporary ‘months’ table with all the values in the original table ‘subscriptions’ using a CROSS JOIN command. We have selected that all values from both tables are joined with one another. Due to the amount of values the tables contain we have limited the query to only return 30 rows, with no specific order of values.



```sql
WITH months AS
 (SELECT
  '2017-01-01' AS first_day,
  '2017-01-31' AS last_day
UNION
   SELECT
  '2017-02-01' AS first_day,
  '2017-02-28' AS last_day
 UNION
    SELECT
    '2017-03-01' AS first_day,
    '2017-03-31' AS last_day),

  cross_join AS (
  SELECT *
  FROM subscriptions
  CROSS JOIN months),

```



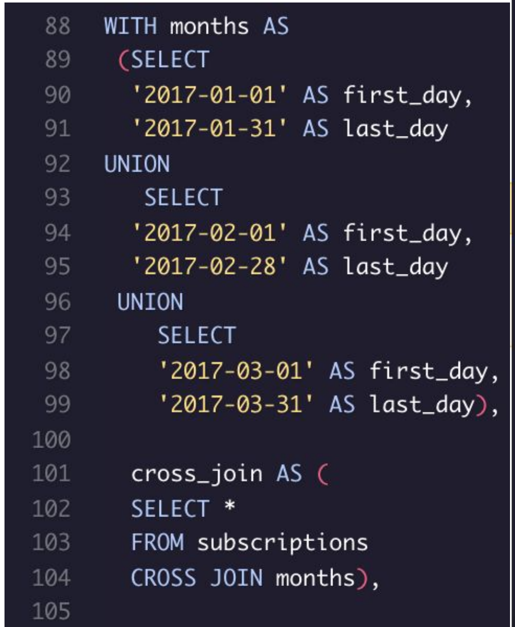
```sql
   status AS(
   SELECT id,
          first_day AS month,
          CASE WHEN segment = 87
          AND (subscription_start < first_day)
          AND (subscription_end > first_day
              OR subscription_end IS NULL)
          THEN 1
          ELSE 0
          END as is_active_87,
          CASE WHEN segment = 30
          AND(subscription_start < first_day)
          AND (subscription_end > first_day
              OR subscription_end IS NULL)
          THEN 1
          ELSE 0
          END as is_active_30
          FROM cross_join)

 SELECT *
 FROM status
 LIMIT 50;
```



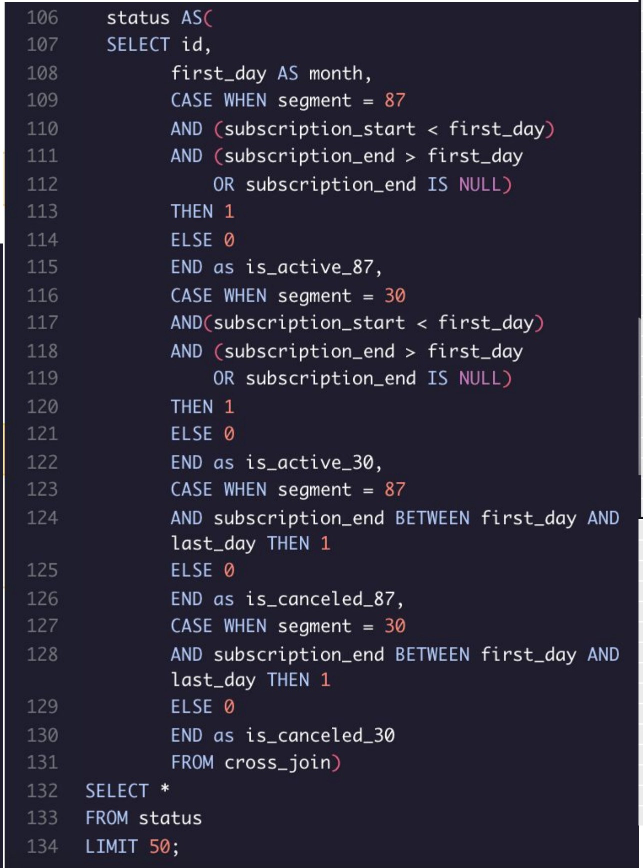
id	month	is_active_87	is_active_30
1	2017-01-01	1	0
1	2017-02-01	0	0
1	2017-03-01	0	0
2	2017-01-01	1	0
2	2017-02-01	0	0
2	2017-03-01	0	0
3	2017-01-01	1	0
3	2017-02-01	1	0
3	2017-03-01	1	0
4	2017-01-01	1	0
4	2017-02-01	1	0
4	2017-03-01	0	0
5	2017-01-01	1	0
5	2017-02-01	1	0
5	2017-03-01	1	0
6	2017-01-01	1	0
6	2017-02-01	0	0
6	2017-03-01	0	0
7	2017-01-01	1	0
7	2017-02-01	1	0
7	2017-03-01	0	0
8	2017-01-01	1	0
8	2017-02-01	1	0
8	2017-03-01	1	0
9	2017-01-01	1	0
9	2017-02-01	1	0
9	2017-03-01	0	0
10	2017-01-01	0	0
10	2017-02-01	0	0
10	2017-03-01	0	0
11	2017-01-01	1	0
11	2017-02-01	0	0
11	2017-03-01	0	0
12	2017-01-01	1	0
12	2017-02-01	1	0
12	2017-03-01	0	0
13	2017-01-01	0	1
13	2017-02-01	0	1
13	2017-03-01	0	1
14	2017-01-01	0	1
14	2017-02-01	0	1
14	2017-03-01	0	1
15	2017-01-01	0	1
15	2017-02-01	0	1
15	2017-03-01	0	0
16	2017-01-01	0	1
16	2017-02-01	0	1
16	2017-03-01	0	1
17	2017-01-01	0	1
17	2017-02-01	0	1

Here we have created another temporary table, ‘status’, that will return a query with all the users from segment 87 and segment 30 who existed prior to the begging of the month. This info will be taken from the previous table we created ‘cross-join’. We use a CASE statement for segment 87 marking all users with a 1 who started before the first day of a month and have an end date or no end date after the first day of a month. We do the same for segment 30.

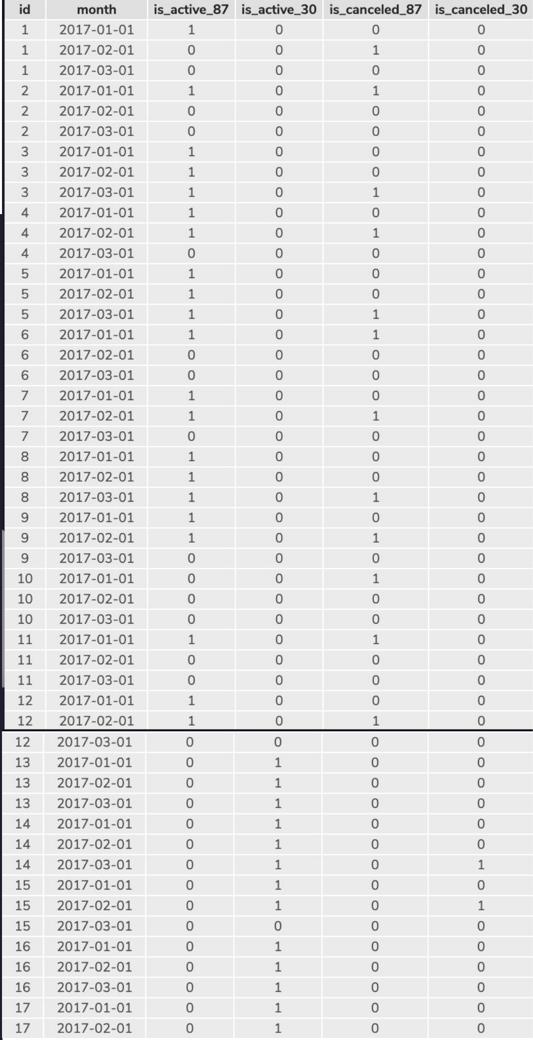
Using the previous syntax we will be adding two more CASE statement columns that return a query containing the users who canceled during a month. To find this we will be using the BETWEEN command to mark all users with a 1 that canceled between the first and last day of each month for segment 87 and the same thing for segment 30.



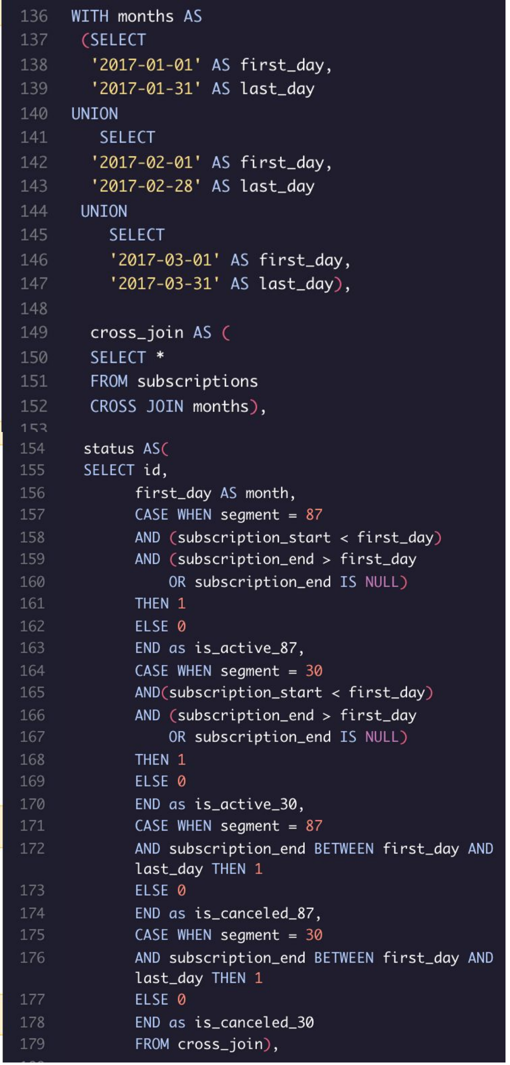
```sql
WITH months AS
 (SELECT
  '2017-01-01' AS first_day,
  '2017-01-31' AS last_day
UNION
   SELECT
  '2017-02-01' AS first_day,
  '2017-02-28' AS last_day
 UNION
    SELECT
    '2017-03-01' AS first_day,
    '2017-03-31' AS last_day),

  cross_join AS (
  SELECT *
  FROM subscriptions
  CROSS JOIN months),

```



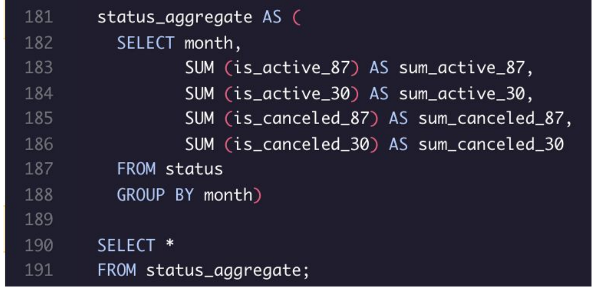
```sql
    status AS(
    SELECT id,
          first_day AS month,
          CASE WHEN segment = 87
          AND (subscription_start < first_day)
          AND (subscription_end > first_day
              OR subscription_end IS NULL)
          THEN 1
          ELSE 0
          END as is_active_87,
          CASE WHEN segment = 30
          AND(subscription_start < first_day)
          AND (subscription_end > first_day
              OR subscription_end IS NULL)
          THEN 1
          ELSE 0
          END as is_active_30,
          CASE WHEN segment = 87
          AND subscription_end BETWEEN first_day AND
          last_day THEN 1
          ELSE 0
          END as is_canceled_87,
          CASE WHEN segment = 30
          AND subscription_end BETWEEN first_day AND
          last_day THEN 1
          ELSE 0
          END as is_canceled_30
          FROM cross_join)
  SELECT *
  FROM status
  LIMIT 50;
```



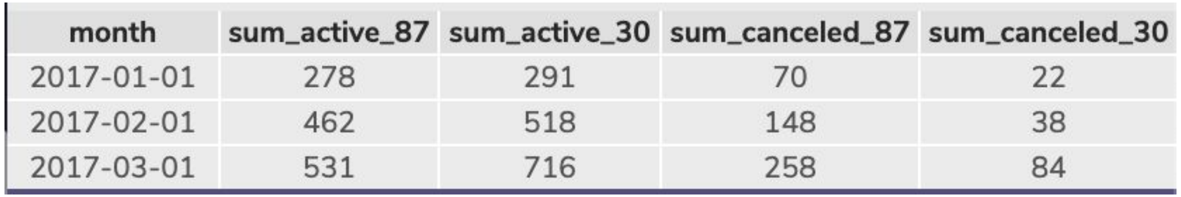
id	month	is_active_87	is_active_30	is_canceled_87	is_canceled_30
1	2017-01-01	1	0	0	0
1	2017-02-01	0	0	1	0
1	2017-03-01	0	0	0	0
2	2017-01-01	1	0	1	0
2	2017-02-01	0	0	0	0
2	2017-03-01	0	0	0	0
3	2017-01-01	1	0	0	0
3	2017-02-01	1	0	0	0
3	2017-03-01	1	0	1	0
4	2017-01-01	1	0	0	0
4	2017-02-01	1	0	1	0
4	2017-03-01	0	0	0	0
5	2017-01-01	1	0	0	0
5	2017-02-01	1	0	0	0
5	2017-03-01	1	0	1	0
6	2017-01-01	1	0	1	0
6	2017-02-01	0	0	0	0
6	2017-03-01	0	0	0	0
7	2017-01-01	1	0	0	0
7	2017-02-01	1	0	1	0
7	2017-03-01	0	0	0	0
8	2017-01-01	1	0	0	0
8	2017-02-01	1	0	0	0
8	2017-03-01	1	0	1	0
9	2017-01-01	1	0	0	0
9	2017-02-01	1	0	1	0
9	2017-03-01	0	0	0	0
10	2017-01-01	0	0	1	0
10	2017-02-01	0	0	0	0
10	2017-03-01	0	0	0	0
11	2017-01-01	1	0	1	0
11	2017-02-01	0	0	0	0
11	2017-03-01	0	0	0	0
12	2017-01-01	1	0	0	0
12	2017-02-01	1	0	1	0
12	2017-03-01	0	0	0	0
13	2017-01-01	0	1	0	0
13	2017-02-01	0	1	0	0
13	2017-03-01	0	1	0	0
14	2017-01-01	0	1	0	0
14	2017-02-01	0	1	0	0
14	2017-03-01	0	1	0	1
15	2017-01-01	0	1	0	0
15	2017-02-01	0	1	0	1
15	2017-03-01	0	0	0	0
16	2017-01-01	0	1	0	0
16	2017-02-01	0	1	0	0
16	2017-03-01	0	1	0	0
17	2017-01-01	0	1	0	0
17	2017-02-01	0	1	0	0



```
WITH months AS
 (SELECT
  '2017-01-01' AS first_day,
  '2017-01-31' AS last_day
UNION
   SELECT
  '2017-02-01' AS first_day,
  '2017-02-28' AS last_day
 UNION
    SELECT
    '2017-03-01' AS first_day,
    '2017-03-31' AS last_day),

  cross_join AS (
  SELECT *
  FROM subscriptions
  CROSS JOIN months),

 status AS(
 SELECT id,
        first_day AS month,
        CASE WHEN segment = 87
        AND (subscription_start < first_day)
        AND (subscription_end > first_day
            OR subscription_end IS NULL)
        THEN 1
        ELSE 0
        END as is_active_87,
        CASE WHEN segment = 30
        AND(subscription_start < first_day)
        AND (subscription_end > first_day
            OR subscription_end IS NULL)
        THEN 1
        ELSE 0
        END as is_active_30,
        CASE WHEN segment = 87
        AND subscription_end BETWEEN first_day AND
        last_day THEN 1
        ELSE 0
        END as is_canceled_87,
        CASE WHEN segment = 30
        AND subscription_end BETWEEN first_day AND
        last_day THEN 1
        ELSE 0
        END as is_canceled_30
        FROM cross_join),
```

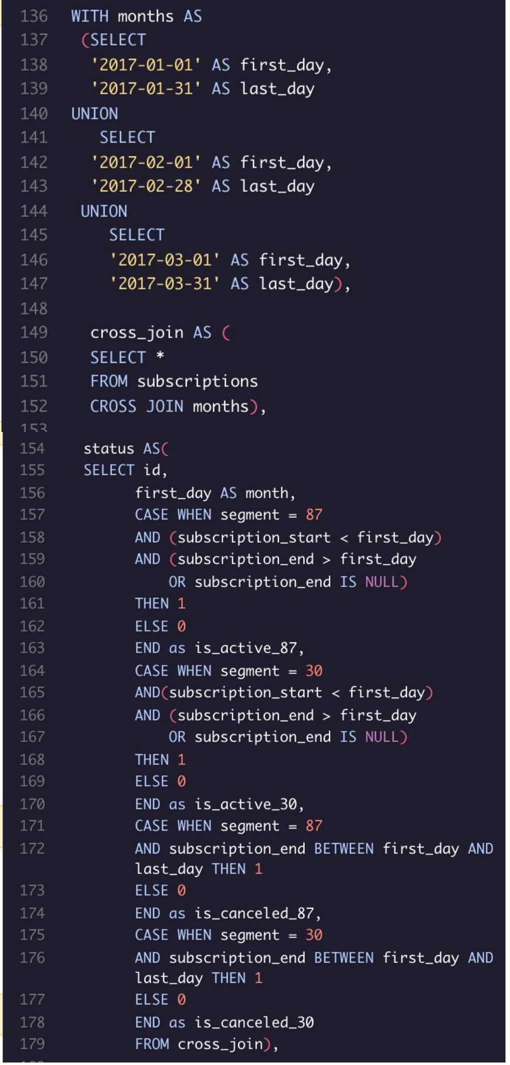


```
status_aggregate AS (
  SELECT month,
         SUM (is_active_87) AS sum_active_87,
         SUM (is_active_30) AS sum_active_30,
         SUM (is_canceled_87) AS sum_canceled_87,
         SUM (is_canceled_30) AS sum_canceled_30
  FROM status
  GROUP BY month)

SELECT *
FROM status_aggregate;
```

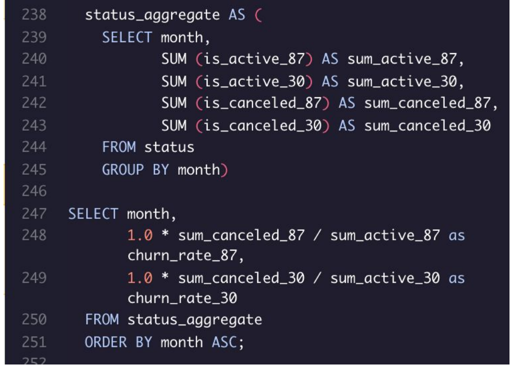


month	sum_active_87	sum_active_30	sum_canceled_87	sum_canceled_30
2017-01-01	278	291	70	22
2017-02-01	462	518	148	38
2017-03-01	531	716	258	84

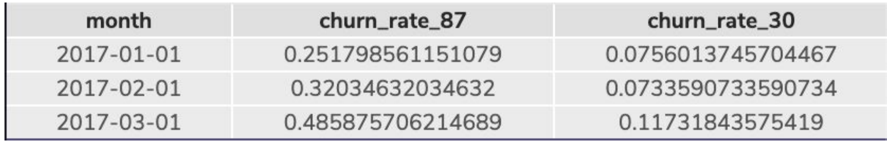
We will now be aggregating the columns we created in the ‘status’ table by creating a new temporary table named ‘status_aggregate’ where we will find the sum of users who are active and canceled for both segments 87 and 30. To find this we will be using the SUM function for each column that was created in the ‘status’ table.



```sql
WITH months AS
 (SELECT
  '2017-01-01' AS first_day,
  '2017-01-31' AS last_day
UNION
   SELECT
  '2017-02-01' AS first_day,
  '2017-02-28' AS last_day
 UNION
    SELECT
    '2017-03-01' AS first_day,
    '2017-03-31' AS last_day),

  cross_join AS (
  SELECT *
  FROM subscriptions
  CROSS JOIN months),

 status AS(
 SELECT id,
       first_day AS month,
       CASE WHEN segment = 87
       AND (subscription_start < first_day)
       AND (subscription_end > first_day
           OR subscription_end IS NULL)
       THEN 1
       ELSE 0
       END as is_active_87,
       CASE WHEN segment = 30
       AND(subscription_start < first_day)
       AND (subscription_end > first_day
           OR subscription_end IS NULL)
       THEN 1
       ELSE 0
       END as is_active_30,
       CASE WHEN segment = 87
       AND subscription_end BETWEEN first_day AND
       last_day THEN 1
       ELSE 0
       END as is_canceled_87,
       CASE WHEN segment = 30
       AND subscription_end BETWEEN first_day AND
       last_day THEN 1
       ELSE 0
       END as is_canceled_30
       FROM cross_join),
```



```sql
  status_aggregate AS (
    SELECT month,
           SUM (is_active_87) AS sum_active_87,
           SUM (is_active_30) AS sum_active_30,
           SUM (is_canceled_87) AS sum_canceled_87,
           SUM (is_canceled_30) AS sum_canceled_30
    FROM status
    GROUP BY month)

SELECT month,
       1.0 * sum_canceled_87 / sum_active_87 as
       churn_rate_87,
       1.0 * sum_canceled_30 / sum_active_30 as
       churn_rate_30
  FROM status_aggregate
  ORDER BY month ASC;
```



month	churn_rate_87	churn_rate_30
2017-01-01	0.251798561151079	0.0756013745704467
2017-02-01	0.32034632034632	0.0733590733590734
2017-03-01	0.485875706214689	0.11731843575419

Now we can calculate the churn rate for each segment for the 3 months that we are looking in to. To find churn we will need to divide the canceled users from the active users, and we will do this for each segment. Multiplying by ‘1.0’ is so the values returned are float values instead of whole numbers.