In [ ]:

```
'''
USE `orders`;

SET @R1 := 365; -- покупали более чем год назад
SET @R3 := 100;
SET @R4 := 60;
SET @R5 := 30; -- менее чем месяц назад

-- frequency
SET @F1 := 1;
SET @F2 := 2;
SET @F3 := 10;
SET @F4 := 20;
SET @F5 := 50;

-- monetary
SET @M1 := 0;
SET @M2 := 500;
SET @M3 := 1000;
SET @M4 := 10000;
SET @M5 := 50000;


-- SET @last_date := (SELECT MAX(`o_date`) FROM `orders_20190822`);
SET @last_date := (SELECT MAX(`o_date`) FROM `orders_20190822` WHERE `o_date` < '2017-01-01');
SET @overall_sum := (SELECT SUM(`price`) FROM `orders_20190822` WHERE `price` > 0 and `o_date` < @last_date);

DROP TABLE IF EXISTS `rfm_table_20170101`;
CREATE TABLE `rfm_table_20170101` AS
WITH
   `R` as (SELECT  `user_id`,
                MAX(`o_date`) `maxdate`,
                DATEDIFF(@last_date, MAX(`o_date`)) `days`
         FROM `orders_20190822`
         WHERE `price` > 0  and `o_date` < @last_date
         GROUP BY `user_id`),

   `F` AS (SELECT `user_id`,
           COUNT(DISTINCT `id_o`) `cnt`
        FROM `orders_20190822`
       WHERE `price` > 0 and `o_date` < @last_date
       GROUP BY `user_id`),

   `M` AS (SELECT `user_id`,
           SUM(`price`) `sum_price`
         FROM `orders_20190822`
         WHERE `price` > 0  and `o_date` < @last_date
         GROUP BY `user_id`),

   `RFM` as (SELECT `R`.`user_id`,
         `R`.`days` as `R`,
         `F`.`cnt` as `F`,
         `M`.`sum_price` as `M`,
         CASE
           WHEN `R`.`days` > @R1 THEN 1 -- более чем год назад
              WHEN `R`.`days` BETWEEN @R3 AND @R1 THEN 2 -- последняя покупка 100-365 дней назад
              WHEN `R`.`days` BETWEEN @R4 and @R3 THEN 3 -- 60-100 дней назад
              WHEN  `R`.`days` BETWEEN @R5 AND @R4 THEN 4 -- 30-60 дней назад
           WHEN `R`.`days` < @R5 THEN 5 -- менее чем 30 дней назад
            ELSE 0
            END as
              `R1`,

            CASE  WHEN `F`.`cnt` = @F1 THEN 1 -- 1 покупка
                WHEN  `F`.`cnt` BETWEEN @F2 AND @F3 THEN 2 -- 2-10 покупок
                WHEN `F`.`cnt` BETWEEN @F3 AND @F4 THEN 3 -- 10-20 покупок
                WHEN `F`.`cnt` BETWEEN @F4 AND @F5 THEN 4 -- 20-50 покупок
            WHEN `F`.`cnt` > @F5 THEN 5 -- больше 50 покупок
            ELSE 0
            END as `F1`,

            CASE WHEN `M`.`sum_price` BETWEEN @M1 AND @M2 THEN 1 -- 0-500р.
                WHEN `M`.`sum_price` BETWEEN @M2 AND @M3 THEN 2 -- 500-1т.р.
                WHEN `M`.`sum_price` BETWEEN @M3 AND @M4 THEN 3 -- 1-10т.р.
                WHEN `M`.`sum_price` BETWEEN @M4 AND @M5 THEN 4 -- 10-50т.р.
                WHEN `M`.`sum_price` > @M5 THEN 5 -- больше 50т.р.
                ELSE 0
            END
             as `M1`


         FROM `R`
         INNER JOIN `F`
         ON `R`.`user_id` = `F`.`user_id`
         INNER JOIN `M`
         ON `F`.`user_id` = `M`.`user_id`),

   `USERGROUPS` AS (SELECT `RFM`.`user_id`,
           `RFM`.`R`,
              `RFM`.`F`,
              CONCAT('R', `RFM`.`R1`,'-', 'F', `RFM`.`F1`, '-', 'M', `RFM`.`M1`) `RFM`,
              CASE
                  WHEN  CONCAT(`RFM`.`R1`,`RFM`.`F1`, `RFM`.`M1`)
                  -- when R1 in (3, 4, 5) and M1 in (4, 5) and F1 in (4, 5) then 'VIP'
                   IN ("555", "455", "355", "345", "354", "445", "325", "335", "554", "545")
                   THEN 'VIP'

                  WHEN CONCAT(`RFM`.`R1`,`RFM`.`F1`, `RFM`.`M1`)
                  -- when R1 in (4, 5) and F1 in (1, 2) and M1 in (1, 2, 3, 4, 5) then 'NEW'
                   IN ("411", "412", "413", "414", "415", "421", "422", "423", "424", "425", "511", "512", "514", "515", "521", "524", "524", "525") /* NEW: R(4, 5)-F(1, 2)-M(
ny)  */
                   THEN 'NEW'

                  WHEN CONCAT(`RFM`.`R1`,`RFM`.`F1`, `RFM`.`M1`)
                  -- when R1 in (1, 2) and F1 in (4, 5) and M1 in (4, 5)
                   IN("144", "145", "154", "155", "244", "224", "314", "245", "223", "254", "255", "241", "242", "313", "243", "251", "252", "253", "225", "231", "232", "233",
234", "235")
                   THEN 'CHURNED'

                  WHEN  CONCAT(`RFM`.`R1`,`RFM`.`F1`, `RFM`.`M1`)
                  -- when R1 in (3, 4, 5) and F1 in (4, 5) and M1 in (3, 4, 5) then 'REGULAR'
                   IN ("544", "543", "533", "534", "535", "454", "434", "435", "531", "443", "441", "442", "444", "333", "341", "342", "343", "344", "321", "322", "323", "324"
"334")
                   THEN 'REGULAR'

                     WHEN CONCAT(`RFM`.`R1`, `RFM`.`F1`, `RFM`.`M1`)
                      IN ("221", "222", "115", "433", "311", "312", "315",  "124", "125", "523", "513", "522")
                      THEN "HOPEFOOL"

                  WHEN CONCAT(`RFM`.`R1`,`RFM`.`F1`, `RFM`.`M1`)
                    IN ("111", "112", "113", "114", "121", "122", "123", "134", "215", "214", "213", "212", "211")
                   THEN 'LOST'

                  ELSE 'undefined_group'

                END as `G`
          FROM `RFM`)

-- consolidated table
  SELECT `u`.`G` `group`,
```

```
    `u`.`user_id` `user_id`,
    `u`.`RFM` `index`,
    -- `t`.`count_by_rfm` `count_by_rfm`,
    `t1`.`count_by_group` `count_by_group`,
    `R`.`days` `days`,
    `F`.`cnt` `orders`,
    `m`.`sum_price` `sum`,
    ROUND(`m`.`sum_price` / @overall_sum, 2) `% of turnover`

FROM `USERGROUPS` `u`
LEFT JOIN `M` `m` ON `u`.`user_id` = `m`.`user_id`
LEFT JOIN `R` ON `R`.`user_id` = `m`.`user_id`
LEFT JOIN `F` ON `F`.`user_id` = `R`.`user_id`
-- LEFT JOIN (SELECT `u`.`user_id`, `u`.`RFM` `index`, COUNT(*) `count_by_rfm`
    -- FROM `USERGROUPS` `u`
    -- GROUP BY `index`) as t
  -- ON `t`.`user_id` = `F`.`user_id`
LEFT JOIN (SELECT `u`.`user_id`, `u`.`G` `group`, COUNT(*) `count_by_group`
    FROM `USERGROUPS` `u`
    GROUP BY `group`) as `t1`
  ON `F`.`user_id` = `t1`.`user_id`

  ;
'''
```

In [1]:

```
import mariadb
import sys
import os
from dotenv import load_dotenv
import pandas as pd
load_dotenv()
passwd = os.getenv('PASSWD')
import seaborn as sns
import matplotlib.pyplot as plt
sns.set_theme(style="ticks", color_codes=True)
```

In [2]:

```
def create_rfm_table(date: str):
    try:
        conn = mariadb.connect(user='root',
                               password=passwd,
                               host='localhost',
                               port=3306,
                               database='orders')
    except mariadb.Error as e:
        print(f'error')
        sys.exit()


    cur = conn.cursor()
    rfm_table = pd.read_sql_query(f'''
                  SELECT * FROM `rfm_table_{(date).replace('-', '')}`''', conn)
    return rfm_table
```

In [3]:

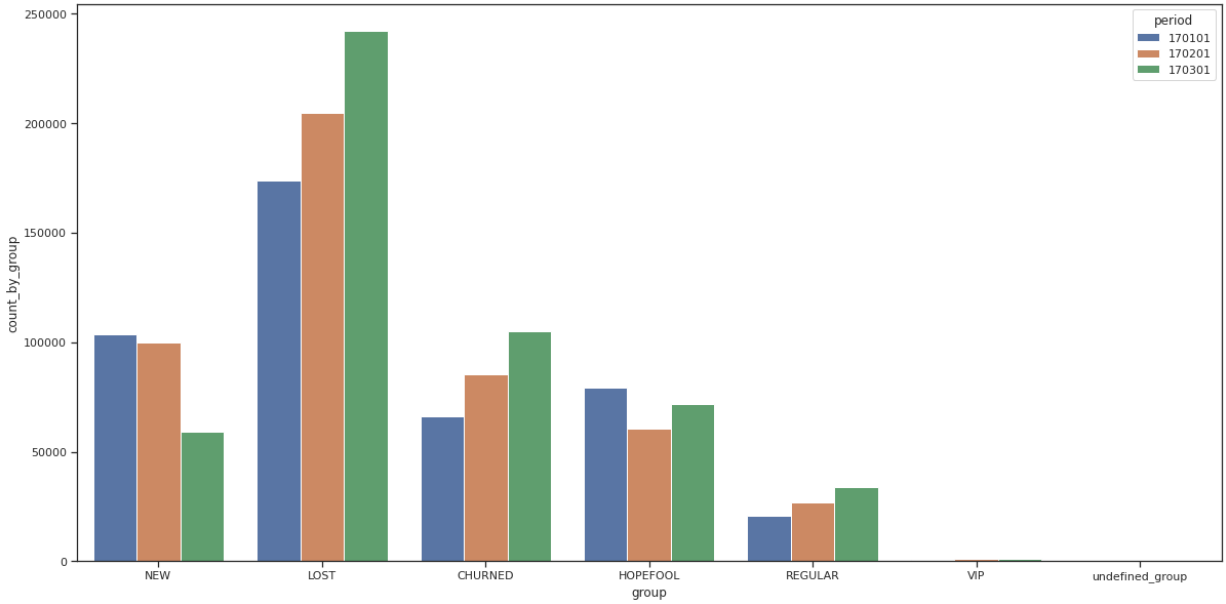
```
rfmtable01 = create_rfm_table('2017-01-01')
rfmtable02 = create_rfm_table('2017-02-01')
rfmtable03 = create_rfm_table('2017-03-01')
```

In [44]:

```
rfm_table = pd.concat([rfmtable01, rfmtable02, rfmtable03], axis=0, sort=False)
vip = rfm_table.loc[((rfm_table['group'] == 'VIP'))]
uf = rfm_table.loc[(rfm_table['group'] == 'undefined_group')]
tiny = pd.concat([vip, uf], axis=0, sort=False)
```

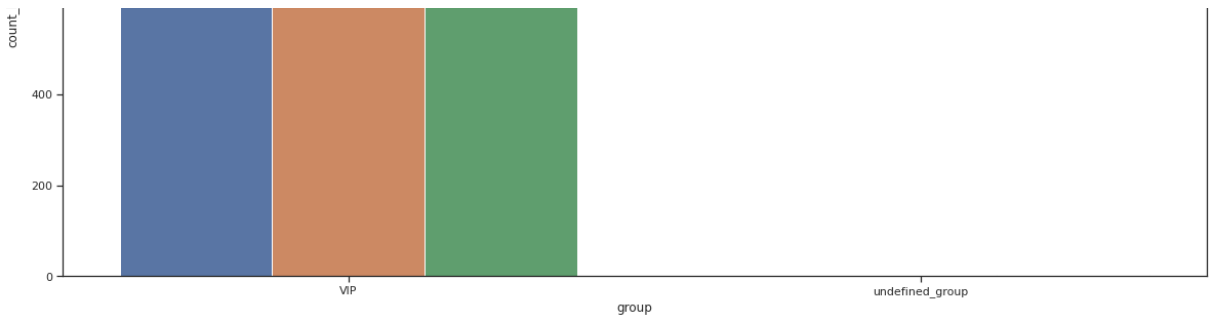
In [47]:

```
plt.figure(figsize=(20, 10))
sns.barplot(x="group", y="count_by_group", hue="period", data=rfm_table);
```



In [48]:

```
plt.figure(figsize=(20, 10))
sns.barplot(x="group", y="count_by_group", hue="period", data=tiny);
```


count_
400
200
0
VIP
undefined_group
group