Раздел 12
Оконные функции
(Window Functions)

Видеокурс: https://stepik.org/a/130488

Особенности оконных функций

- Другое название - аналитические оконные функции
- Нужны относительно редко
-

Особенности оконных функций

- Другое название - аналитические оконные функции
- Нужны относительно редко
- Пример:

```
SUM(n_albums) OVER (…)
```

Сценарий 1:
Детальные данные + агрегация

band_extended

band_id	name	year	n_albums
303	The Beatles	1957	17
93	Metallica	1981	11
192	Queen	1970	14

Сценарий 1:
Детальные данные + агрегация

band_extended

band_id	name	year	n_albums
303	The Beatles	1957	17
93	Metallica	1981	11
192	Queen	1970	14

Результат

band_id	name	year	n_albums	total
303	The Beatles	1957	17	42
93	Metallica	1981	11	42
192	Queen	1970	14	42

Сценарий 1:
Детальные данные + агрегация

band_extended

band_id	name	year	n_albums
303	The Beatles	1957	17
93	Metallica	1981	11
192	Queen	1970	14

Результат

band_id	name	year	n_albums	total	pct_albums
303	The Beatles	1957	17	42	40.47
93	Metallica	1981	11	42	26.19
192	Queen	1970	14	42	33.33

Сценарий 1:
Детальные данные + агрегация

band_extended

band_id	name	year	n_albums
303	The Beatles	1957	17
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Результат

band_id	name	year	n_albums	total	pct_albums
303	The Beatles	1957	17	42	40.47
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Сценарий 1:
Детальные данные + агрегация

band_extended

band_id	name	year	n_albums
303	The Beatles	1957	17
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Результат

band_id	name	year	n_albums	total	pct_albums
303	The Beatles	1957	17	42	40.47
93	Metallica	1981	11	42	26.19
192	Queen	1970	14	42	33.33

```
SELECT SUM(n_albums) as total
  FROM band_extended
 WHERE band_id IN (303,93,192)
```

Сценарий 1: Детальные данные + агрегация

band_extended

band_id	name	year	n_albums
303	The Beatles	1957	17
93	Metallica	1981	11
192	Queen	1970	14

Результат

band_id	name	year	n_albums	total	pct_albums
303	The Beatles	1957	17	42	40.47
93	Metallica	1981	11	42	26.19
192	Queen	1970	14	42	33.33

```
SELECT SUM(n_albums) as total
  FROM band_extended
 WHERE band_id IN (303,93,192)
-- запрос возвращает 1 строку
```

Сценарий 1: Детальные данные + агрегация

band_extended

band_id	name	year	n_albums
303	The Beatles	1957	17
93	Metallica	1981	11
192	Queen	1970	14

Результат

band_id	name	year	n_albums	total	pct_albums
303	The Beatles	1957	17	42	40.47
93	Metallica	1981	11	42	26.19
192	Queen	1970	14	42	33.33

```
SELECT band_id, name, year, n_albums
  FROM band_extended
 WHERE band_id IN (303,93,192)
 -- запрос возвращает 3 строки
```

```
SELECT SUM(n_albums) as total
  FROM band_extended
 WHERE band_id IN (303,93,192)
 -- запрос возвращает 1 строку
```

Считаем проценты

Результат

band_id	name	year	n_albums	total
303	The Beatles	1957	17	42
93	Metallica	1981	11	42
192	Queen	1970	14	42

```
SELECT d.band_id, d.name, d.year, d.n_albums,
       a.total
 FROM band_extended as d
CROSS JOIN (
       SELECT SUM(n_albums) as total
         FROM band_extended
       WHERE band_id IN (303,93,192)
      ) as a
WHERE d.band_id IN (303,93,192)
```

Считаем проценты

Результат

band_id	name	year	n_albums	total	pct_albums
303	The Beatles	1957	17	42	40.47
93	Metallica	1981	11	42	26.19
192	Queen	1970	14	42	33.33

```
SELECT d.band_id, d.name, d.year, d.n_albums,
        a.total, d.n_albums * 100.00 / a.total as pct_albums
 FROM band_extended as d
CROSS JOIN (
        SELECT SUM(n_albums) as total
          FROM band_extended
        WHERE band_id IN (303,93,192)
       ) as a
WHERE d.band_id IN (303,93,192)
```

Считаем проценты

Результат

band_id	name	year	n_albums	total
303	The Beatles	1957	17	42
93	Metallica	1981	11	42
192	Queen	1970	14	42

```
SELECT d.band_id, d.name, d.year, d.n_albums,
        SUM(d.n_albums) OVER () as total
  FROM band_extended as d
WHERE d.band_id IN (303,93,192)
```

Считаем проценты

Результат

band_id	name	year	n_albums	total	pct_albums
303	The Beatles	1957	17	42	40.47
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```
SELECT d.band_id, d.name, d.year, d.n_albums,
       SUM(d.n_albums) OVER () as total,
       d.n_albums * 100.00 / SUM(d.n_albums) OVER () as pct_albums
  FROM band_extended as d
WHERE d.band_id IN (303,93,192)
```

Считаем проценты

Результат

band_id	name	year	n_albums	pct_albums
303	The Beatles	1957	17	40.47
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```
SELECT d.band_id, d.name, d.year, d.n_albums,
        d.n_albums * 100.00 / SUM(d.n_albums) OVER () as pct_albums
  FROM band_extended as d
WHERE d.band_id IN (303,93,192)
```

Оконные функции - добавляем PARTITION BY

Различные функции агрегации

SUM(n_albums) OVER ()

Различные функции агрегации

```
SUM(n_albums) OVER ()
AVG(n_albums) OVER ()

COUNT(*) OVER ()
COUNT(n_albums) OVER ()

MIN(n_albums) OVER ()
MAX(n_albums) OVER ()
```

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
74821	Sheer Heart Attack	192	1974
297418	A Kind of Magic	192	1986

band

band_id	name
93	Metallica
192	Queen

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
74821	Sheer Heart Attack	192	1974
297418	A Kind of Magic	192	1986

band

band_id	name
93	Metallica
192	Queen

Результат

album_id	name	band_id	year	min_year	years_since_1st
18725	Master of Puppets	93	1986	1986	0
19318	The Black Album	93	1991	1986	5
54326	Queen II	192	1974	1974	0
74821	Sheer Heart Attack	192	1974	1974	0
297418	A Kind of Magic	192	1986	1974	12

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
74821	Sheer Heart Attack	192	1974
297418	A Kind of Magic	192	1986

Результат

album_id	name	band_id	year	min_year	
18725	Master of Puppets	93	1986	1986	
19318	The Black Album	93	1991	1986	
54326	Queen II	192	1974	1974	
74821	Sheer Heart Attack	192	1974	1974	
297418	A Kind of Magic	192	1986	1974	

```
SELECT band_id, MIN(year) as min_year
  FROM album
 WHERE band_id IN (93,192)
GROUP BY band_id
```

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
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Результат

album_id	name	band_id	year	min_year	
18725	Master of Puppets	93	1986	1986	
19318	The Black Album	93	1991	1986	
54326	Queen II	192	1974	1974	
74821	Sheer Heart Attack	192	1974	1974	
297418	A Kind of Magic	192	1986	1974	

```
SELECT band_id, MIN(year) as min_year
  FROM album
 WHERE band_id IN (93,192)
GROUP BY band_id
```

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
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Результат

album_id	name	band_id	year	min_year
18725	Master of Puppets	93	1986	1986
19318	The Black Album	93	1991	1986
54326	Queen II	192	1974	1974
74821	Sheer Heart Attack	192	1974	1974
297418	A Kind of Magic	192	1986	1974

```
SELECT band_id, MIN(year) as min_year
  FROM album
 WHERE band_id IN (93,192)
GROUP BY band_id
```

band_id	min_year
93	1986
192	1974

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
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Результат

album_id	name	band_id	year	min_year
18725	Master of Puppets	93	1986	1974
19318	The Black Album	93	1991	1974
54326	Queen II	192	1974	1974
74821	Sheer Heart Attack	192	1974	1974
297418	A Kind of Magic	192	1986	1974

```
SELECT album_id, name, band_id, year,
        MIN(year) OVER () as min_year
  FROM album
WHERE band_id IN (93,192)
```

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
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Результат

album_id	name	band_id	year	min_year	
18725	Master of Puppets	93	1986	1986	
19318	The Black Album	93	1991	1986	
54326	Queen II	192	1974	1974	
74821	Sheer Heart Attack	192	1974	1974	
297418	A Kind of Magic	192	1986	1974	

```
SELECT album_id, name, band_id, year,
        MIN(year) OVER (PARTITION BY band_id) as min_year
  FROM album
WHERE band_id IN (93,192)
```

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
74821	Sheer Heart Attack	192	1974
297418	A Kind of Magic	192	1986

Результат

album_id	name	band_id	year	min_year	years_since_1st
18725	Master of Puppets	93	1986	1986	0
19318	The Black Album	93	1991	1986	5
54326	Queen II	192	1974	1974	0
74821	Sheer Heart Attack	192	1974	1974	0
297418	A Kind of Magic	192	1986	1974	12

```
SELECT album_id, name, band_id, year,
        MIN(year) OVER (PARTITION BY band_id) as min_year,
        year - MIN(year) OVER (PARTITION BY band_id) as years_since_1st
  FROM album
WHERE band_id IN (93,192)
```

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
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18725	Master of Puppets	93	1986	1986	0
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54326	Queen II	192	1974	1974	0
74821	Sheer Heart Attack	192	1974	1974	0
297418	A Kind of Magic	192	1986	1974	12

```
SELECT album_id, name, band_id, year, min_year, year - min_year as years_since_1st
    FROM  (  SELECT album_id, name, band_id, year,
                 MIN(year) OVER (PARTITION BY band_id) as min_year
               FROM album
             WHERE band_id IN (93,192)
              ) as subquery_alias
```

Кол-во лет с первого альбома

album

album_id	name	band_id	year
18725	Master of Puppets	93	1986
19318	The Black Album	93	1991
54326	Queen II	192	1974
74821	Sheer Heart Attack	192	1974
297418	A Kind of Magic	192	1986

Результат

album_id	name	band_id	year	min_year	years_since_1st
18725	Master of Puppets	93	1986	1986	0
19318	The Black Album	93	1991	1986	5
54326	Queen II	192	1974	1974	0
74821	Sheer Heart Attack	192	1974	1974	0
297418	A Kind of Magic	192	1986	1974	12

```
SELECT album_id, name, band_id, year,
        MIN(year) OVER (PARTITION BY band_id) as min_year,
         year - MIN(year) OVER (PARTITION BY band_id) as years_since_1st
  FROM album
WHERE band_id IN (93,192)
```

Вариант без оконных функций

```
SELECT d.album_id, d.name, d.band_id, d.year,
       a.min_year, d.year - a.min_year as years_since_1st
  FROM album as d
INNER JOIN (
       SELECT band_id, MIN(year) as min_year
         FROM album
       WHERE band_id IN (93,192)
     GROUP BY band_id
       ) as a
      ON a.band_id = d.band_id
WHERE d.band_id IN (93,192)
```

Кумулятивные суммы
(Накопительные суммы)

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	
171274	Pearls of Passion	1811	1986	2006	
753467	Look Sharp!	1811	1988	1507	
754582	Joyride	1811	1991	1211	
892075	Tourism	1811	1992	1323	
1482431	Crash! Boom! Bang!	1811	1994	4068	

band

band_id	name
1811	Roxette

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115

band

band_id	name
1811	Roxette

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
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band

band_id	name
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Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
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754582	Joyride	1811	1991	1211	4724
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1482431	Crash! Boom! Bang!	1811	1994	4068	10115

band

band_id	name
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Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
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1482431	Crash! Boom! Bang!	1811	1994	4068	10115

band

band_id	name
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Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
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band

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Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
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band

band_id	name
1811	Roxette

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
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1482431	Crash! Boom! Bang!	1811	1994	4068	10115

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN UNBOUNDED PRECEDING
                                AND CURRENT ROW
        ) as cumulative_sales
  FROM album_sales
 WHERE band_id = 1811
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
74821	Sheer Heart Attack	192	1974	1062	1062
54326	Queen II	192	1974	472	1534
297418	A Kind of Magic	192	1986	1770	3304

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
   FROM album_sales
 WHERE band_id IN (93,192)
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
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```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
   FROM album_sales
  WHERE band_id IN (93,192)
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
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SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
   FROM album_sales
  WHERE band_id IN (93,192)
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
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```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                        AND CURRENT ROW
        ) as cumulative_sales
   FROM album_sales
  WHERE band_id IN (93,192)
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
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```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
   FROM album_sales
  WHERE band_id IN (93,192)
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
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```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
   FROM album_sales
  WHERE band_id IN (93,192)
```

Особенности ORDER BY

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN UNBOUNDED PRECEDING
                                AND CURRENT ROW
        ) as cumulative_sales
  FROM album_sales
 WHERE band_id = 1811
```

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
-

Замечания про ORDER BY

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
892075	Tourism	1811	1992	1323	1323
753467	Look Sharp!	1811	1988	1507	2830
754582	Joyride	1811	1991	1211	4041
1482431	Crash! Boom! Bang!	1811	1994	4068	8109
171274	Pearls of Passion	1811	1986	2006	10115

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (
                                ROWS BETWEEN UNBOUNDED PRECEDING
                                        AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id = 1811
```

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
- ORDER BY оконной функции может отличаться от финального ORDER BY

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN UNBOUNDED PRECEDING
                                AND CURRENT ROW
        ) as cumulative_sales
  FROM album_sales
 WHERE band_id = 1811
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
1482431	Crash! Boom! Bang!	1811	1994	4068	10115
754582	Joyride	1811	1991	1211	4724
753467	Look Sharp!	1811	1988	1507	3513
171274	Pearls of Passion	1811	1986	2006	2006
892075	Tourism	1811	1992	1323	6047

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN UNBOUNDED PRECEDING
                                        AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id = 1811
ORDER BY name
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
1482431	Crash! Boom! Bang!	1811	1994	4068	10115
754582	Joyride	1811	1991	1211	4724
753467	Look Sharp!	1811	1988	1507	3513
171274	Pearls of Passion	1811	1986	2006	2006
892075	Tourism	1811	1992	1323	6047

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN UNBOUNDED PRECEDING
                                        AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id = 1811
ORDER BY name
```

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
1482431	Crash! Boom! Bang!	1811	1994	4068	10115
754582	Joyride	1811	1991	1211	4724
753467	Look Sharp!	1811	1988	1507	3513
171274	Pearls of Passion	1811	1986	2006	2006
892075	Tourism	1811	1992	1323	6047

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115

UNDED PRECEDING
ENT ROW

ORDER BY name

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
1482431	Crash! Boom! Bang!	1811	1994	4068	10115
754582	Joyride	1811	1991	1211	4724
753467	Look Sharp!	1811	1988	1507	3513
171274	Pearls of Passion	1811	1986	2006	2006
892075	Tourism	1811	1992	1323	6047

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115

UNDED PRECEDING
ENT ROW

ORDER BY name

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
- ORDER BY оконной функции может отличаться от финального ORDER BY
- Для проверки удобно указывать финальный ORDER BY таким же, как в оконной функции

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id = 1811
ORDER BY year
```

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
74821	Sheer Heart Attack	192	1974	1062	1062
54326	Queen II	192	1974	472	1534
297418	A Kind of Magic	192	1986	1770	3304

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id IN (93,192)
ORDER BY band_id, year
```

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
74821	Sheer Heart Attack	192	1974	1062	1062
54326	Queen II	192	1974	472	1534
297418	A Kind of Magic	192	1986	1770	3304

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
   FROM album_sales
 WHERE band_id IN (93,192)
```

Две оконные функции

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales	sales_rank
171274	Pearls of Passion	1811	1986	2006	2006	2
753467	Look Sharp!	1811	1988	1507	3513	3
754582	Joyride	1811	1991	1211	4724	5
892075	Tourism	1811	1992	1323	6047	4
1482431	Crash! Boom! Bang!	1811	1994	4068	10115	1

```
SELECT album_id, name, band_id, year, total_sales,
      SUM(total_sales) OVER (ORDER BY year
                ROWS BETWEEN UNBOUNDED PRECEDING  AND CURRENT ROW
      ) as cumulative_sales,
      COUNT(*) OVER (ORDER BY total_sales DESC
                ROWS BETWEEN UNBOUNDED PRECEDING AND CURRENT ROW
      ) as sales_rank
    FROM album_sales
  WHERE band_id = 1811
```

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
- ORDER BY оконной функции может отличаться от финального ORDER BY
- Для проверки удобно указывать финальный ORDER BY таким же, как в оконной функции
- Если нужен финальный ORDER BY - указываем явно

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
- ORDER BY оконной функции может отличаться от финального ORDER BY
- Для проверки удобно указывать финальный ORDER BY таким же, как в оконной функции
- Если нужен финальный ORDER BY - указываем явно
- Если не нужен финальный ORDER BY - не указываем
-

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
- ORDER BY оконной функции может отличаться от финального ORDER BY
- Для проверки удобно указывать финальный ORDER BY таким же, как в оконной функции
- Если нужен финальный ORDER BY - указываем явно
- Если не нужен финальный ORDER BY - не указываем
- Будьте аккуратны со значениями NULL

Кумулятивные суммы

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115
-100123	Lost Roxette Album	1811	null	1000	11115

album_sales

Кумулятивные суммы

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115
-100123	Lost Roxette Album	1811	null	1000	11115

album_id	name	band_id	year	total_sales	cumulative_sales
-100123	Lost Roxette Album	1811	null	1000	1000
171274	Pearls of Passion	1811	1986	2006	3006
753467	Look Sharp!	1811	1988	1507	4513
754582	Joyride	1811	1991	1211	5724
892075	Tourism	1811	1992	1323	7047
1482431	Crash! Boom! Bang!	1811	1994	4068	11115

album_sales

Кумулятивные суммы

album_id	name	band_id	year	total_sales	cumulative_sales
171274	Pearls of Passion	1811	1986	2006	2006
753467	Look Sharp!	1811	1988	1507	3513
754582	Joyride	1811	1991	1211	4724
892075	Tourism	1811	1992	1323	6047
1482431	Crash! Boom! Bang!	1811	1994	4068	10115
-100123	Lost Roxette Album	1811	null	1000	11115

album_id	name	band_id	year	total_sales	cumulative_sales
-100123	Lost Roxette Album	1811	null	1000	1000
171274	Pearls of Passion	1811	1986	2006	3006
753467	Look Sharp!	1811	1988	1507	4513
754582	Joyride	1811	1991	1211	5724
892075	Tourism	1811	1992	1323	7047
1482431	Crash! Boom! Bang!	1811	1994	4068	11115

ORDER BY для NULL

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

ORDER BY для NULL

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

```
SELECT a
  FROM mytable_int
ORDER BY a
```

Результат

a
1
2
3
22
[null]

ORDER BY для NULL

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

```
SELECT a
  FROM mytable_int
ORDER BY a
```

```
ORDER BY a NULLS LAST
```

Результат

a
1
2
3
22
[null]

```
SELECT a
  FROM mytable_int
ORDER BY a NULLS FIRST
```

Результат

a
[null]
1
2
3
22

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

```
SELECT a
  FROM mytable_int
ORDER BY a
```

Результат

a
1
2
3
22
[null]

```
ORDER BY a NULLS LAST
```

Результат

a
[null]
22
3
2
1

```
SELECT a
  FROM mytable_int
ORDER BY a DESC
```

```
SELECT a
  FROM mytable_int
ORDER BY a NULLS FIRST
```

Результат

a
[null]
1
2
3
22

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

```
SELECT a
  FROM mytable_int
ORDER BY a
ORDER BY a NULLS LAST
```

Результат

a
1
2
3
22
[null]

Результат

a
[null]
22
3
2
1

```
SELECT a
  FROM mytable_int
ORDER BY a DESC
```

```
ORDER BY a DESC
               NULLS FIRST
```

```
SELECT a
  FROM mytable_int
ORDER BY a NULLS FIRST
```

Результат

a
[null]
1
2
3
22

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

```
SELECT a
  FROM mytable_int
ORDER BY a
```

```
ORDER BY a NULLS LAST
```

Результат

a
1
2
3
22
[null]

Результат

a
[null]
22
3
2
1

```
SELECT a
  FROM mytable_int
ORDER BY a DESC
```

```
ORDER BY a DESC
                NULLS FIRST
```

```
SELECT a
  FROM mytable_int
ORDER BY a NULLS FIRST
```

Результат

a
[null]
1
2
3
22

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

```
SELECT a
  FROM mytable_int
ORDER BY a
```

```
ORDER BY a NULLS LAST
```

Результат

a
1
2
3
22
[null]

Результат

a
[null]
22
3
2
1

```
SELECT a
  FROM mytable_int
ORDER BY a DESC
```

```
SELECT a
  FROM mytable_int
ORDER BY a NULLS FIRST
```

Результат

a
[null]
1
2
3
22

```
ORDER BY a DESC
                NULLS FIRST
```

mytable_int

a	…
3	…
1	…
2	…
[null]	…
22	…

Результат

a
22
3
2
1
[null]

```
SELECT a
  FROM mytable_int
ORDER BY a DESC
                NULLS LAST
```

```
SELECT a
  FROM mytable_int
ORDER BY a
```

```
ORDER BY a NULLS LAST
```

Результат

a
1
2
3
22
[null]

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
- ORDER BY оконной функции может отличаться от финального ORDER BY
- Для проверки удобно указывать финальный ORDER BY таким же, как в оконной функции
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- Если не нужен финальный ORDER BY - не указываем
- Будьте аккуратны со значениями NULL

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
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- Если нужен финальный ORDER BY - указываем явно
- Если не нужен финальный ORDER BY - не указываем
- Будьте аккуратны со значениями NULL
- Желательно делать сортировку однозначной

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
74821	Sheer Heart Attack	192	1974	1062	1062
54326	Queen II	192	1974	472	1534
297418	A Kind of Magic	192	1986	1770	3304

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id IN (93,192)
ORDER BY year
```

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
74821	Sheer Heart Attack	192	1974	1062	1062
54326	Queen II	192	1974	472	1534
297418	A Kind of Magic	192	1986	1770	3304

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                            AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id IN (93,192)
ORDER BY year
```

album_sales

album_id	name	band_id	year	total_sales	cumulative_sales
18725	Master of Puppets	93	1986	2006	2006
19318	The Black Album	93	1991	2595	4601
54326	Queen II	192	1974	472	472
74821	Sheer Heart Attack	192	1974	1062	1534
297418	A Kind of Magic	192	1986	1770	3304

```
SELECT album_id, name, band_id, year, total_sales,
        SUM(total_sales) OVER (PARTITION BY band_id
                               ORDER BY year, album_id
                               ROWS BETWEEN UNBOUNDED PRECEDING
                                        AND CURRENT ROW
        ) as cumulative_sales
    FROM album_sales
  WHERE band_id IN (93,192)
ORDER BY year, album_id
```

Замечания про ORDER BY

- ORDER BY по ошибке можно забыть!
- ORDER BY оконной функции может отличаться от финального ORDER BY
- Для проверки удобно указывать финальный ORDER BY таким же, как в оконной функции
- Если нужен финальный ORDER BY - указываем явно
- Если не нужен финальный ORDER BY - не указываем
- Будьте аккуратны со значениями NULL
- Желательно делать сортировку однозначной

Скользящие средние, предыдущие значения

Варианты ROWS BETWEEN

```
ORDER BY year
ROWS BETWEEN UNBOUNDED PRECEDING
        AND CURRENT ROW
```

Всё, что раньше + текущая строка

Варианты ROWS BETWEEN

```
ORDER BY year
ROWS BETWEEN UNBOUNDED PRECEDING
             AND CURRENT ROW
```

Всё, что раньше + текущая строка

```
ORDER BY year
ROWS BETWEEN 3 PRECEDING
             AND CURRENT ROW
```

Три предыдущие строки + текущая строка

Варианты ROWS BETWEEN

```
ORDER BY year
ROWS BETWEEN UNBOUNDED PRECEDING
                AND CURRENT ROW
```

Всё, что раньше + текущая строка

```
ORDER BY year
ROWS BETWEEN 3 PRECEDING
                AND CURRENT ROW
```

Три предыдущие строки + текущая строка

```
ORDER BY year
ROWS BETWEEN 3 PRECEDING
                AND 3 FOLLOWING
```

Три предыдущие строки + текущая строка + три следующие строки

PRECEDING v.s. FOLLOWING

Текущая строка + всё, что дальше

```
ORDER BY sales
ROWS BETWEEN CURRENT ROW
             AND UNBOUNDED FOLLOWING
```

Sales	SUM(…)
100	…
472	…
1770	6371
2006	…
2595	…

PRECEDING v.s. FOLLOWING

Текущая строка + всё, что дальше

```
ORDER BY sales
ROWS BETWEEN CURRENT ROW
             AND UNBOUNDED FOLLOWING
```

Sales	SUM(…)
100	…
472	…
1770 →	6371
2006	…
2595	…

Меняем порядок сортировки:

Все предыдущие строки + текущая строка

```
ORDER BY sales DESC
ROWS BETWEEN UNBOUNDED PRECEDING
             AND CURRENT ROW
```

Sales	SUM(…)
2595	…
2006	…
1770 →	6371
472	…
100	…

Можно и без текущей строки

```
ORDER BY year
ROWS BETWEEN 2 PRECEDING
             AND 1 PRECEDING
```

Предыдущие 2 строки

Предыдущие строки

album_sales

album_id	name	band_id	year	total_sales	avg2_sales
171274	Pearls of Passion	1811	1986	2006	[null]
753467	Look Sharp!	1811	1988	1507	2006.00
754582	Joyride	1811	1991	1211	1756.50
892075	Tourism	1811	1992	1323	1574.66
1482431	Crash! Boom! Bang!	1811	1994	4068	1347.00

```
SELECT album_id, name, band_id, year, total_sales,
        AVG(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN 2 PRECEDING
                                AND 1 PRECEDING
        ) as avg2_sales
  FROM album_sales
 WHERE band_id = 1811
ORDER BY year
```

Предыдущие строки

album_sales

album_id	name	band_id	year	total_sales	avg2_sales
171274	Pearls of Passion	1811	1986	2006	[null]
753467	Look Sharp!	1811	1988	1507	2006.00
754582	Joyride	1811	1991	1211	1756.50
892075	Tourism	1811	1992	1323	1574.66
1482431	Crash! Boom! Bang!	1811	1994	4068	1347.00

```
SELECT album_id, name, band_id, year, total_sales,
        AVG(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN 2 PRECEDING
                                AND 1 PRECEDING
        ) as avg2_sales
  FROM album_sales
 WHERE band_id = 1811
ORDER BY year
```

Предыдущие строки

album_sales

album_id	name	band_id	year	total_sales	avg2_sales
171274	Pearls of Passion	1811	1986	2006	[null]
753467	Look Sharp!	1811	1988	1507	2006.00
754582	Joyride	1811	1991	1211	1756.50
892075	Tourism	1811	1992	1323	1574.66
1482431	Crash! Boom! Bang!	1811	1994	4068	1347.00

```
SELECT album_id, name, band_id, year, total_sales,
        AVG(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN 2 PRECEDING
                                AND 1 PRECEDING
        ) as avg2_sales
  FROM album_sales
 WHERE band_id = 1811
ORDER BY year
```

Предыдущие строки

album_sales

album_id	name	band_id	year	total_sales	avg2_sales
171274	Pearls of Passion	1811	1986	2006	[null]
753467	Look Sharp!	1811	1988	1507	2006.00
754582	Joyride	1811	1991	1211	1756.50
892075	Tourism	1811	1992	1323	1574.66
1482431	Crash! Boom! Bang!	1811	1994	4068	1347.00

```
SELECT album_id, name, band_id, year, total_sales,
        AVG(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN 2 PRECEDING
                                AND 1 PRECEDING
        ) as avg2_sales
  FROM album_sales
 WHERE band_id = 1811
ORDER BY year
```

Предыдущие строки

album_sales

album_id	name	band_id	year	total_sales	avg2_sales
171274	Pearls of Passion	1811	1986	2006	[null]
753467	Look Sharp!	1811	1988	1507	2006.00
754582	Joyride	1811	1991	1211	1756.50
892075	Tourism	1811	1992	1323	1574.66
1482431	Crash! Boom! Bang!	1811	1994	4068	1347.00

```
SELECT album_id, name, band_id, year, total_sales,
        AVG(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN 2 PRECEDING
                                AND 1 PRECEDING
        ) as avg2_sales
  FROM album_sales
 WHERE band_id = 1811
ORDER BY year
```

Предыдущие строки

album_sales

album_id	name	band_id	year	total_sales	avg2_sales
171274	Pearls of Passion	1811	1986	2006	[null]
753467	Look Sharp!	1811	1988	1507	2006.00
754582	Joyride	1811	1991	1211	1756.50
892075	Tourism	1811	1992	1323	1574.66
1482431	Crash! Boom! Bang!	1811	1994	4068	1347.00

```
SELECT album_id, name, band_id, year, total_sales,
        AVG(total_sales) OVER (ORDER BY year
                                ROWS BETWEEN 2 PRECEDING
                                AND 1 PRECEDING
        ) as avg2_sales
  FROM album_sales
 WHERE band_id = 1811
ORDER BY year
```

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 PRECEDING
                                    AND 1 PRECEDING )
```

LAG

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 PRECEDING
                                    AND 1 PRECEDING )
```

```
LAG(total_sales, 1) OVER (ORDER BY year)
```

LAG

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 PRECEDING
                                    AND 1 PRECEDING )
```

```
LAG(total_sales, 1) OVER (ORDER BY year)
```

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 FOLLOWING
                                    AND 1 FOLLOWING )
```

LAG, LEAD

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 PRECEDING
                                    AND 1 PRECEDING )
```

```
LAG(total_sales, 1) OVER (ORDER BY year)
```

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 FOLLOWING
                                    AND 1 FOLLOWING )
```

```
LEAD(total_sales, 1) OVER (ORDER BY year)
```

LAG, LEAD

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 PRECEDING
                                    AND 1 PRECEDING )
```

```
LAG(total_sales, 1) OVER (ORDER BY year)
```

```
MAX(total_sales) OVER (ORDER BY year
                       ROWS BETWEEN 1 FOLLOWING
                                    AND 1 FOLLOWING )
```

```
LEAD(total_sales, 1) OVER (ORDER BY year)
```

```
LAG(total_sales, 1)   OVER (ORDER BY year DESC)
```

LAG - пример

album

album_id	name	band_id	year	previous_year	
171274	Pearls of Passion	1811	1986	[null]	
753467	Look Sharp!	1811	1988	1986	
754582	Joyride	1811	1991	1988	
892075	Tourism	1811	1992	1991	
1482431	Crash! Boom! Bang!	1811	1994	1992	

```
SELECT album_id, name, band_id, year,
       LAG(year,1) OVER (ORDER BY year) as previous_year
  FROM album
 WHERE band_id = 1811
ORDER BY year
```

LAG - пример

album

album_id	name	band_id	year	previous_year	
171274	Pearls of Passion	1811	1986	[null]	
753467	Look Sharp!	1811	1988	1986	
754582	Joyride	1811	1991	1988	
892075	Tourism	1811	1992	1991	
1482431	Crash! Boom! Bang!	1811	1994	1992	

```
SELECT album_id, name, band_id, year,
        LAG(year,1) OVER (ORDER BY year) as previous_year
  FROM album
 WHERE band_id = 1811
ORDER BY year
```

LAG - пример

album

album_id	name	band_id	year	previous_year	years_diff
171274	Pearls of Passion	1811	1986	- [null] =	[null]
753467	Look Sharp!	1811	1988	- 1986 =	2
754582	Joyride	1811	1991	- 1988 =	3
892075	Tourism	1811	1992	- 1991 =	1
1482431	Crash! Boom! Bang!	1811	1994	- 1992 =	2

```
SELECT album_id, name, band_id, year,
       LAG(year,1) OVER (ORDER BY year) as previous_year,
       year - LAG(year,1) OVER (ORDER BY year) as years_diff
  FROM album
 WHERE band_id = 1811
ORDER BY year
```

LAG - пример

album

album_id	name	band_id	year	previous_year	years_diff
171274	Pearls of Passion	1811	1986	- [null] =	[null]
753467	Look Sharp!	1811	1988	- 1986 =	2
754582	Joyride	1811	1991	- 1988 =	3
892075	Tourism	1811	1992	- 1991 =	1
1482431	Crash! Boom! Bang!	1811	1994	- 1992 =	2

```
SELECT album_id, name, band_id, year,
       LAG(year,1) OVER (ORDER BY year) as previous_year,
       year - LAG(year,1) OVER (ORDER BY year) as years_diff
  FROM album
 WHERE band_id = 1811
ORDER BY year
```

Можно добавить PARTITION BY

Нумерация и ранжирование

Нумерация

album_sales

album_id	name	band id	year	total_sales			
1388822	Simplicity	2454	2014	1000000			
1093213	Twisted Wires & The	2454	2011	231250			
619738	Real to Reel: Reel 1	2454	2007	31240			
635891	Real to Reel: Reel 2	2454	2007	31240			
802853	Forever More	2454	2008	24480			

band

band_id	name
2454	Tesla

```
SELECT *
  FROM album_sales
 WHERE band_id = 2454
ORDER BY total_sales DESC
```

Нумерация

album_sales

album_id	name	band id	year	total_sales	rn		
1388822	Simplicity	2454	2014	1000000	1		
1093213	Twisted Wires & The	2454	2011	231250	2		
619738	Real to Reel: Reel 1	2454	2007	31240	3		
635891	Real to Reel: Reel 2	2454	2007	31240	4		
802853	Forever More	2454	2008	24480	5		

```
SELECT a.*,
        ROW_NUMBER() OVER (ORDER BY total_sales DESC, album_id) as rn
  FROM album_sales as a
 WHERE band_id = 2454
ORDER BY total_sales DESC, album_id
```

Нумерация

album_sales

album_id	name	band id	year	total_sales	rn		
1388822	Simplicity	2454	2014	1000000	1		
1093213	Twisted Wires & The	2454	2011	231250	2		
619738	Real to Reel: Reel 1	2454	2007	31240	3		
635891	Real to Reel: Reel 2	2454	2007	31240	4		
802853	Forever More	2454	2008	24480	5		

```
SELECT a.*,
        ROW_NUMBER() OVER (ORDER BY total_sales DESC, album_id) as rn
  FROM album_sales as a
 WHERE band_id = 2454
ORDER BY total_sales DESC, album_id
```

Ранжирование

album_sales

album_id	name	band id	year	total_sales	rn	rank	
1388822	Simplicity	2454	2014	1000000	1	1	
1093213	Twisted Wires & The	2454	2011	231250	2	2	
619738	Real to Reel: Reel 1	2454	2007	31240	3	3	
635891	Real to Reel: Reel 2	2454	2007	31240	4	3	
802853	Forever More	2454	2008	24480	5	5	

```
SELECT a.*,
        ROW_NUMBER() OVER (ORDER BY total_sales DESC, album_id) as rn ,
        RANK()       OVER (ORDER BY total_sales DESC) as rank
  FROM album_sales as a
 WHERE band_id = 2454
ORDER BY total_sales DESC, album_id
```

Ранжирование

album_sales

album_id	name	band id	year	total_sales	rn	rank	
1388822	Simplicity	2454	2014	1000000	1	1	
1093213	Twisted Wires & The	2454	2011	231250	2	2	
619738	Real to Reel: Reel 1	2454	2007	31240	3	3	
635891	Real to Reel: Reel 2	2454	2007	31240	4	3	
802853	Forever More	2454	2008	24480	5	5	

```
SELECT a.*,
       ROW_NUMBER() OVER (ORDER BY total_sales DESC, album_id) as rn ,
       RANK()       OVER (ORDER BY total_sales DESC) as rank
  FROM album_sales as a
 WHERE band_id = 2454
ORDER BY total_sales DESC, album_id
```

Ранжирование

album_sales

album_id	name	band id	year	total_sales	rn	rank	d_rank
1388822	Simplicity	2454	2014	1000000	1	1	1
1093213	Twisted Wires & The	2454	2011	231250	2	2	2
619738	Real to Reel: Reel 1	2454	2007	31240	3	3	3
635891	Real to Reel: Reel 2	2454	2007	31240	4	3	3
802853	Forever More	2454	2008	24480	5	5	4

```
SELECT a.*,
       ROW_NUMBER() OVER (ORDER BY total_sales DESC, album_id) as rn ,
       RANK()       OVER (ORDER BY total_sales DESC) as rank,
       DENSE_RANK()  OVER (ORDER BY total_sales DESC) as d_rank
  FROM album_sales as a
 WHERE band_id = 2454
ORDER BY total_sales DESC, album_id
```

Резюме по оконным функциям

Когда нужны оконные функции

1. Детальные данные + агрегированные данные
2. Кумулятивные суммы
3. Скользящие средние
4. Предыдущие и последующие строки
5. Нумерация и ранжирование строк

Когда нужны оконные функции

1. Детальные данные + агрегированные данные
2. Кумулятивные суммы
3. Скользящие средние
4. Предыдущие и последующие строки
5. Нумерация и ранжирование строк

- Нужны относительно редко