

# Раздел 7

## Соединение таблиц (joins)

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

# IN с подзапросом

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock group

Результат

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

# IN с подзапросом

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock group

Результат

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

```
SELECT *
  FROM album
 WHERE band_id IN (SELECT band_id
                      FROM band
                   )
```

# INNER JOIN

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock group

Результат

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

```
SELECT a.*  
FROM album as a  
INNER JOIN band as b  
ON a.band_id = b.band_id  
;
```

# INNER JOIN (M:1)

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock group

Результат

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

```

SELECT a.album_id, a.name,
       a.band_id, b.name as band_name
  FROM album as a
INNER JOIN band as b
        ON a.band_id = b.band_id
    
```

# Алиасы

```
SELECT *  
FROM album as a  
INNER JOIN band as b  
    ON a.band_id = b.band_id  
;
```

```
SELECT *  
FROM album  
INNER JOIN band  
    ON album.band_id = band.band_id  
;
```

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock group

# Алиасы - осторожно

```

SELECT comment
FROM album as a
INNER JOIN band as b
ON a.band_id = b.band_id
;
```



```

SELECT b.comment
FROM album as a
INNER JOIN band as b
ON a.band_id = b.band_id
;
```



# 1:M

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock

album

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

```
SELECT b.band_id, b.name as band_name,  
      a.album_id, a.name  
   FROM band as b  
INNER JOIN album as a  
     ON a.band_id = b.band_id
```

Результат

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

# Сравнение

M:1

1:M

```
SELECT a.album_id, a.name,  
a.band_id, b.name as band_name  
FROM album as a  
INNER JOIN band as b  
ON a.band_id = b.band_id
```

```
SELECT b.band_id, b.name  
as band_name, a.album_id, a.name  
FROM band as b  
INNER JOIN album as a  
ON a.band_id = b.band_id
```

Результат

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

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

# 1:M

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock

album

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

```
SELECT b.band_id, b.name as band_name,  
      a.album_id, a.name  
   FROM band as b  
INNER JOIN album as a  
     ON a.band_id = b.band_id
```

Результат

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

M:1

Результат

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock

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

```
SELECT a.album_id, a.name,  
       a.band_id, b.name as band_name  
  FROM album as a  
INNER JOIN band as b  
    ON a.band_id = b.band_id
```

# Дубликаты

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
93	RockBand	0	
192	Queen	1970	UK rock

Результат

album_id	name	band_id	band_name
19318	The Black Album	93	Metallica
19318	The Black Album	93	RockBand
18725	Master of Puppets	93	Metallica
18725	Master of Puppets	93	RockBand
297418	A Kind of Magic	192	Queen
54326	Queen II	192	Queen
74821	Sheer Heart Attack	192	Queen

```

SELECT a.album_id, a.name,
       a.band_id, b.name as band_name
  FROM album as a
INNER JOIN band as b
        ON a.band_id = b.band_id
    
```

# Нехватка строк

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	

Результат

album_id	name	band_id	band_name
19318	The Black Album	93	Metallica
18725	Master of Puppets	93	Metallica

```

SELECT a.album_id, a.name,
       a.band_id, b.name as band_name
  FROM album as a
INNER JOIN band as b
    ON a.band_id = b.band_id
  
```

# Проверка данных

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock

```
SELECT count(*), count(distinct band_id)
  FROM band
-- 3, 3
```

```
SELECT count(*)
  FROM album
 WHERE band_id NOT IN
      (SELECT band_id
        FROM band
       WHERE band_id is not null)
```

```
OR band_id IS NULL
-- 0
```

# OUTER JOIN

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	

Результат

album_id	name	band_id	band_name
19318	The Black Album	93	Metallica
18725	Master of Puppets	93	Metallica
297418	A Kind of Magic	192	[null]
54326	Queen II	192	[null]
74821	Sheer Heart Attack	192	[null]

```

SELECT a.album_id, a.name,
       a.band_id, b.name as band_name
  FROM album as a
LEFT OUTER JOIN band as b
        ON a.band_id = b.band_id
    
```

# OUTER JOIN

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock

album

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

```
SELECT b.band_id, b.name as band_name,  
a.album_id, a.name as album_name
```

FROM band **as** b

LEFT OUTER JOIN album **as** a

ON a.band\_id = b.band\_id

Результат

band_id	band_name	album_id	album_name
303	The Beatles	[null]	[null]
93	Metallica	19318	The Black Album
93	Metallica	18725	Master of Puppets
192	Queen	297418	A Kind of Magic
192	Queen	54326	Queen II
192	Queen	74821	Sheer Heart Attack

## band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock

## album

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

```
SELECT b.band_id, b.name as band_name,  
a.album_id, a.name as album_name  
FROM band as b  
LEFT OUTER JOIN album as a  
ON a.band_id = b.band_id  
WHERE a.name='Master of Puppets'
```

Результат

band_id	band_name	album_id	album_name
93	Metallica	18725	Master of Puppets

## band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock

## album

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

```
SELECT b.band_id, b.name as band_name,  
a.album_id, a.name as album_name  
FROM band as b  
LEFT OUTER JOIN album as a  
ON a.band_id = b.band_id  
AND a.name='Master of Puppets'
```

## Результат

band_id	band_name	album_id	album_name
303	The Beatles	[null]	[null]
93	Metallica	18725	Master of Puppets
192	Queen	[null]	[null]

# Вариации синтаксиса

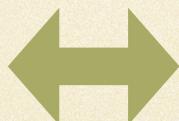
```
SELECT *  
    FROM album as a  
INNER JOIN band as b  
        ON a.band_id = b.band_id  
WHERE b.name='Metallica'  
;
```



```
SELECT *  
    FROM album as a,  
         band as b  
WHERE a.band_id = b.band_id  
    AND b.name='Metallica'  
;
```

# Вариации синтаксиса - 2

```
SELECT *  
      FROM album as a  
INNER JOIN band as b  
        ON a.band_id = b.band_id
```



```
SELECT *  
      FROM album as a  
JOIN band as b  
        ON a.band_id = b.band_id
```

```
SELECT *  
      FROM album as a  
LEFT OUTER JOIN band as b  
        ON a.band_id = b.band_id
```



```
SELECT *  
      FROM album as a  
LEFT JOIN band as b  
        ON a.band_id = b.band_id
```

# RIGHT OUTER JOIN

```
SELECT *
  FROM album as a
LEFT OUTER JOIN band as b
    ON a.band_id = b.band_id
```

```
SELECT *
  FROM album as a
RIGHT OUTER JOIN band as b
    ON a.band_id = b.band_id
```

# LEFT v.s. RIGHT

```
SELECT a.album_id, a.name,  
       b.band_id, b.name as band_name  
  FROM album as a  
LEFT OUTER JOIN band as b  
        ON a.band_id = b.band_id
```

```
SELECT a.album_id, a.name,  
       b.band_id, b.name as band_name  
  FROM band as b  
RIGHT OUTER JOIN album as a  
        ON a.band_id = b.band_id
```

## album

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

## band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	

## Результат

album_id	name	b_id1	b_id2	band_name
19318	The Black Album	93	93	Metallica
18725	Master of Puppets	93	93	Metallica
297418	A Kind of Magic	192	[null]	[null]
54326	Queen II	192	[null]	[null]
74821	Sheer Heart Attack	192	[null]	[null]
[null]	[null]	[null]	303	The Beatles

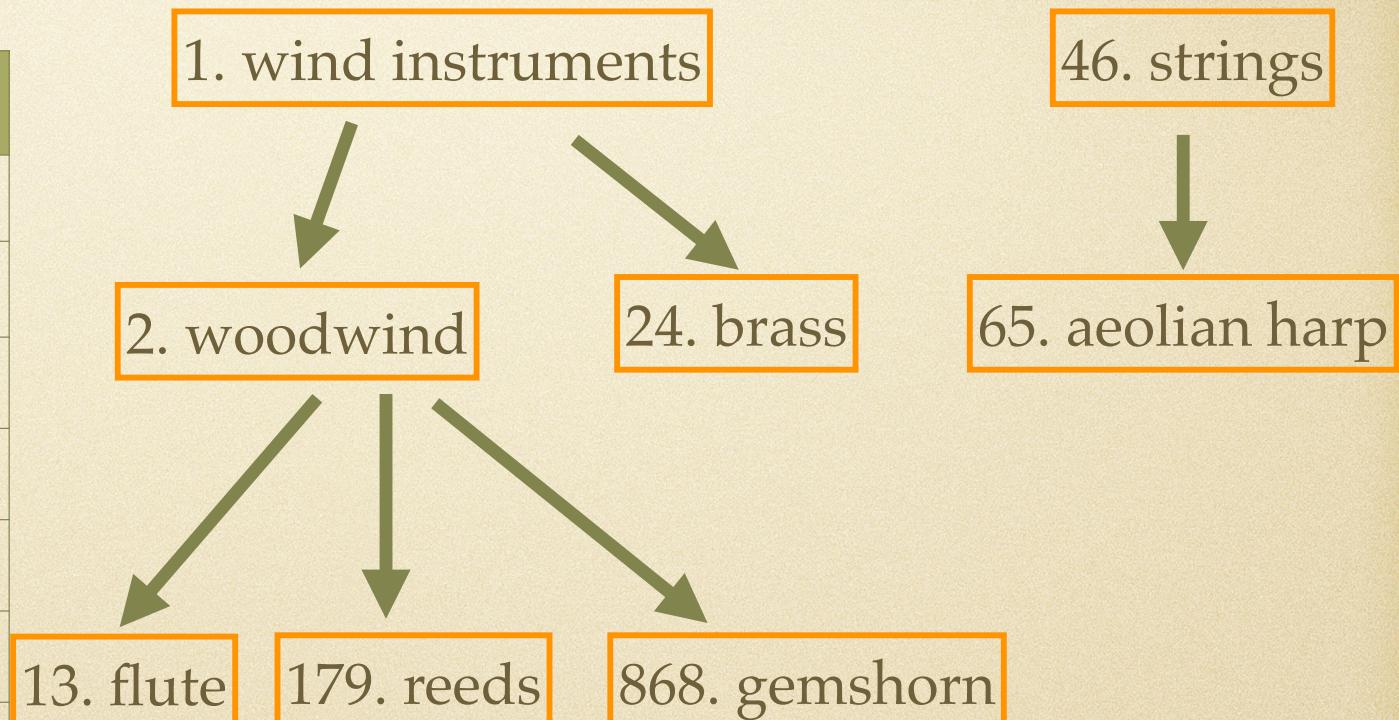
```

SELECT a.album_id, a.name,
       a.band_id as b_id1,
       b.band_id as b_id2,
       b.name as band_name
FROM album as a
FULL OUTER JOIN band as b
ON a.band_id = b.band_id
    
```

# Иерархия в одной таблице

music\_instrument

id	name	parent_id
1	wind instruments	[null]
46	strings	[null]
24	brass	1
2	woodwind	1
65	aeolian harp	46
13	flute	2
179	reeds	2
868	gemshorn	2



## music\_instrument

id	name	parent_id
1	wind instruments	[null]
46	strings	[null]
24	brass	1
2	woodwind	1
65	aeolian harp	46
13	flute	2
179	reeds	2
868	gemshorn	2

## Результат

## music\_instrument

id	name	parent_id	parent_name	parent_id	parent_name
1	wind	1	wind instruments	[null]	[null]
46	strings	46	strings	[null]	[null]
24	brass	24	brass	wind instruments	1
2	woodwind	2	woodwind	wind instruments	1
65	aeolian harp	65	aeolian harp	46	strings
13	flute	13	flute	2	woodwind
179	reeds	179	reeds	2	woodwind
868	gemshorn	868	gemshorn	2	woodwind

```

SELECT a.*,
       b.name as parent_name
  FROM music_instrument as a
 LEFT JOIN music_instrument as b
    ON b.id = a.parent_id
  
```

music\_instrument

id	name	parent_id
1	wind instruments	[null]
46	strings	[null]
24	brass	1
2	woodwind	1
65	aeolian harp	46
13	flute	2
179	reeds	2
868	gemshorn	2

Результат

id	name	parent_id	parent_name	gp_id	gp_name
1	wind instruments	[null]	[null]	[null]	[null]
46	strings	[null]	[null]	[null]	[null]
24	brass	1	wind instruments	[null]	[null]
2	woodwind	1	wind instruments	[null]	[null]
65	aeolian harp	46	strings	[null]	[null]
13	flute	2	woodwind	1	wind instruments
179	reeds	2	woodwind	1	wind instruments
868	gemshorn	2	woodwind	1	wind instruments

```

SELECT a.* , b.name as parent_name, c.id as gp_id, c.name as gp_name
FROM music_instrument as a
LEFT OUTER JOIN music_instrument as b ON b.id = a.parent_id
LEFT OUTER JOIN music_instrument as c ON c.id = b.parent_id
    
```

music\_instrument

id	name	parent_id
1	wind instruments	[null]
46	strings	[null]
24	brass	1
2	woodwind	1
65	aeolian harp	46
13	flute	2
179	reeds	2
868	gemshorn	2

Результат

id	name	id	child_id	name	parent_id
1	wind instruments	1	24	wind instruments	[null]
1	wind instruments	46	2	strings	1
46	strings	24	65	brass	1
		2		aeolian harp	46
		65		woodwind	1
		13		flute	2
		179		reeds	2
		868		gemshorn	2

```

SELECT a.id, a.name, b.id as child_id,
       b.name as child_name
  FROM music_instrument as a
LEFT JOIN music_instrument as b
    ON b.parent_id = a.id
 WHERE a.parent_id is null
  
```

## Два уровня

id	name	child_id	child_name
1	wind instruments	24	brass
1	wind instruments	2	woodwind
46	strings	65	aeolian harp

## Результат

id	name	child_id	child_name	grandchild_id	grandchild_name
1	wind instruments	24	brass	[null]	[null]
1	wind instruments	2	woodwind	13	flute
1	wind instruments	2	woodwind	179	reeds
1	wind instruments	2	woodwind	868	gemshorn
46	strings	65	aeolian harp	[null]	[null]

## music\_instrument

id	name	parent_id
1	wind instruments	[null]
46	strings	[null]
24	brass	1
2	woodwind	1
65	aeolian harp	46
13	flute	2
179	reeds	2
868	gemshorn	2

```

SELECT a.id, a.name, b.id as child_id,
       b.name as child_name, c.id as grandchild_id,
       c.name as grandchild_name
  FROM music_instrument as a
LEFT JOIN music_instrument as b ON b.parent_id = a.id
LEFT JOIN music_instrument as c ON c.parent_id = b.id
WHERE a.parent_id is null
    
```

# CROSS JOIN

album

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

band

band_id	name	year	comment
303	The Beatles	1957	
93	Metallica	1981	
192	Queen	1970	UK rock group

```
SELECT a.album_id, a.name,
       a.band_id as b_id1,
       b.band_id as b_id2,
       b.name as band_name
  FROM album as a
CROSS JOIN band as b
```

Результат

album_id	name	b_id1	b_id2	band_name
19318	The Black Album	93	303	The Beatles
19318	The Black Album	93	93	Metallica
19318	The Black Album	93	192	Queen
18725	Master of Puppets	93	303	The Beatles
18725	Master of Puppets	93	93	Metallica

# CROSS JOIN

```
SELECT *  
      FROM album as a  
CROSS JOIN band as b
```

```
SELECT *  
      FROM album as a,  
           band as b
```