



# DATABASE



Kafedra: “Raqali texnologiyalar va sun’iy intellekt”

Fan: Ma’lumotlar bazasi

❖ 5 kredit

❖ Umumiy soat: 150 soat

➤ Ma’ruza: 20 soat

➤ Amaliyot: 40 soat

➤ Mustaqil ta’lim: 90 soat

Maktabni tamomlashing bilan yiliga 40 ming dollar maosh olib keladigan ishni topish dargumon. Shaxsiy limuziniga ega kompaniya rahbari bo‘lish uchun shunga yarasha harakat qilish zarur.

Bill Gates



**Fan o‘qituvchisi:**

**PhD. Toirov Sh.A.**



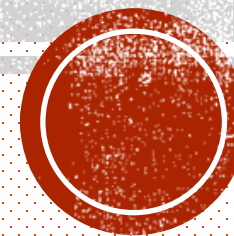


# DATABASE



TIQXMMI  
Toshkent Irrigatsiya va Qishloq Xo'jaligini  
Mexanizatsiyalash Muhandislari Intituti

## №5-MA'RUZA: RELYATSION ALGEBRA VA RELYATSION HISOBLASH ELEMENTLARI



**Fan o'qituvchisi:**  
*PhD.* **Toirov Sh.A.**

# Reja:

15:05



Relyatsion algebra nima?

15:20



Relyatsion algebra va uning amallari

15:05



Relyatsion hisoblash va uning elementlari

15:55



Mustahkamlash uchun savol-javoblar

16:15



Yo'qlama





# 1. RELYATSION ALGEBRA NIMA?



Relyatsion algebra to'plamlar nazariyasiga asoslangan ma'lumotlar bazasi munosabatlarning asosi hisoblanadi.

Ya'ni **relyatsion algebra** – bu relyatsion ma'lumotlar modelidagi munosabatlar bo'yicha amallarning yopiq tizimidir.

**Relyatsion algebra** jadvallar bo'yicha bajariladigan amallar tili bo'lib, relyatsion ma'lumotlar bazasi jadvallari relyatsion algebra operatsiyalari dastlabki munosabatlarning o'zini o'zgartirmasdan bir yoki bir nechta jadvallarga asoslangan boshqa jadvalni yaratishga imkon beradi.

Hosil qilingan jadval odatda ma'lumotlar bazasiga yozilmaydi, bu esa SQL so'rovini bajarish natijasida hosil bo'ladi.





# 1. RELYATSION ALGEBRA NIMA?

Relyatsion ma'lumotlar bazasida axborotlarni ortiqchaligini normallashtirish yo'li bilan kamaytiriladi. Jadvallar ustida har xil amallar berish mumkin. Bu amallarni 1970 – yilda Edgar Frank Kodd tartiblab ishlab chiqqan.

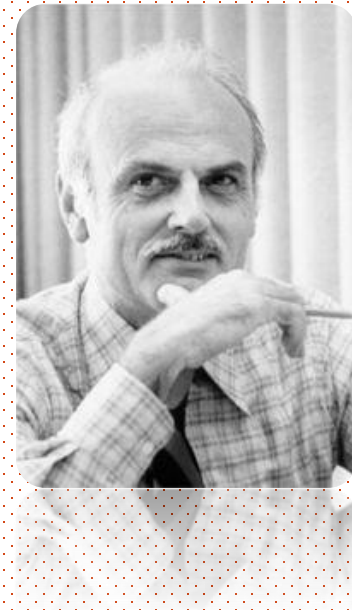
Har qanday relyatsion algebra amalining natijasi yangi munosabatdir. Bunday amallar tizimlari yopiq tizim ham deb ataladi. Relyatsion algebraning 7 ta asosiy amali mavjud bo'lib, ular ikki guruhga bo'lingan.

**Birinchisi har qanday to'plam (jadval) larda bajariladigan amallarni o'z ichiga oladi:**

- ✓ Birlashma (Union);
- ✓ Kesishma (Intersect);
- ✓ Ayirma (Minus);
- ✓ Dekart ko'paytma;

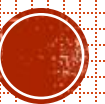
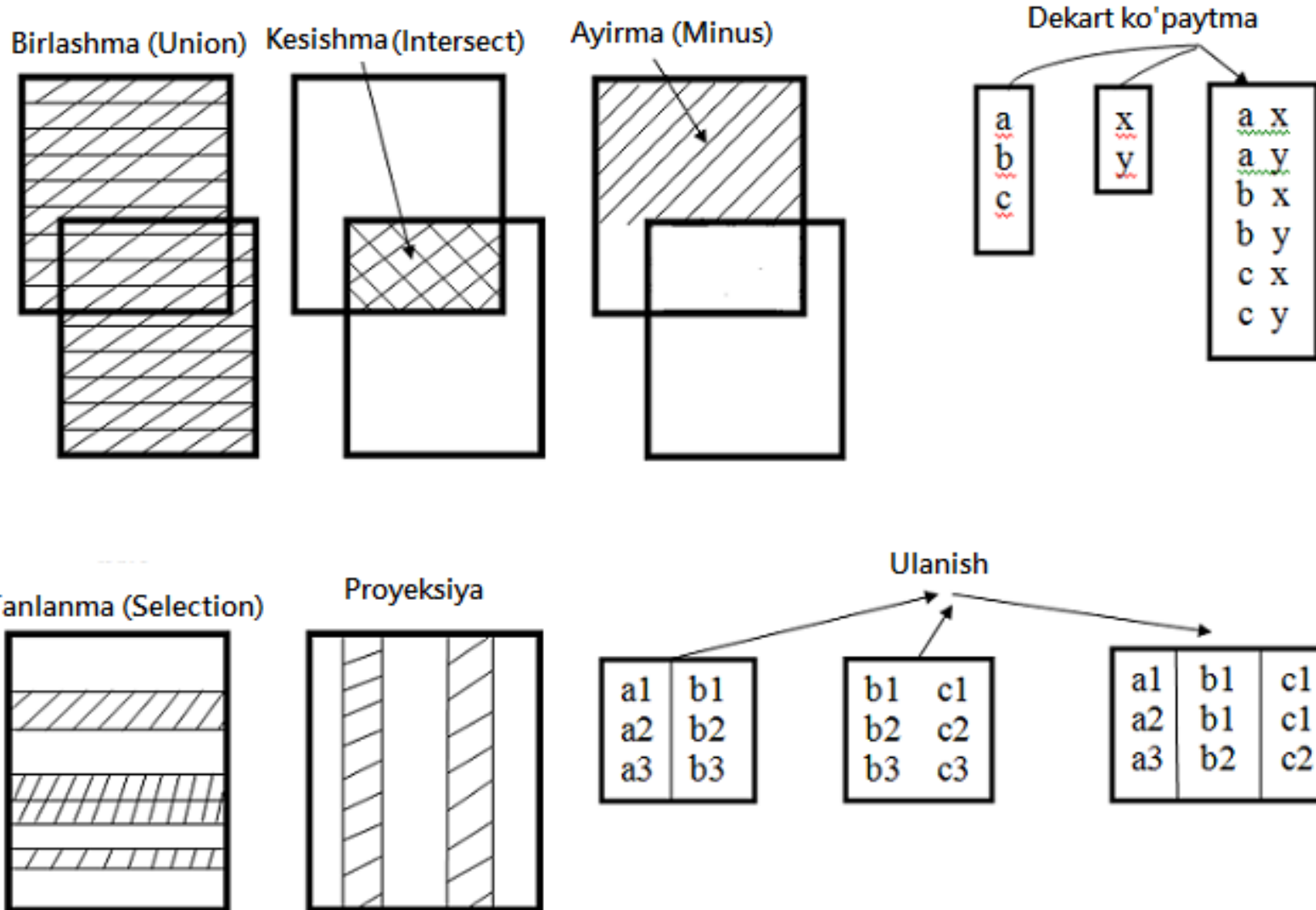
**Ikkinchi guruhga faqat munosabatlarga taalluqli amallar kiradi:**

- Tanlab olish (Selection);
- Proyeksiya;
- Birikma.



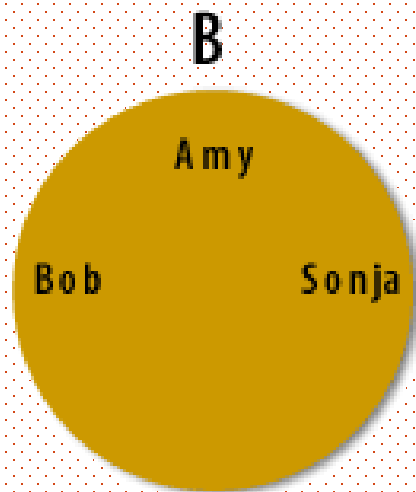
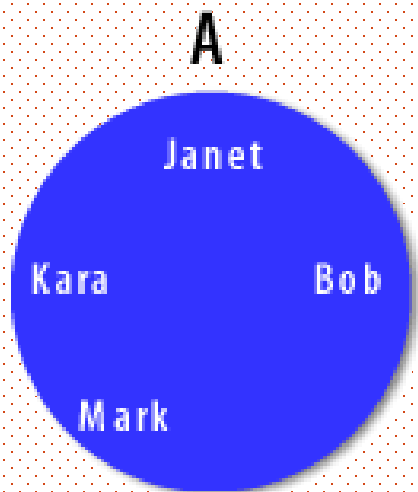


## 2. RELYATSION ALGEBRA VA UNING AMALLARI





## 2. RELYATSION ALGEBRA VA UNING AMALLARI



```
select *from Real_asosiy
```

Results Explain Describe Saved S

FISH	RAQAMI	YOSHI
Kazimiro	14	30
David Alaba	4	30
Ferlan Mendi	23	27
Vinisius Jr	20	22
Karim Benzema	9	35
Tibo Kutrua	1	30
Eder Militao	3	24
Dani Karvaxal	2	30
Toni Kross	8	32
Luka Modrich	10	37
Marco Asensio	11	28

```
select *from Real_zaxira
```

Results Explain Describe Saved SC

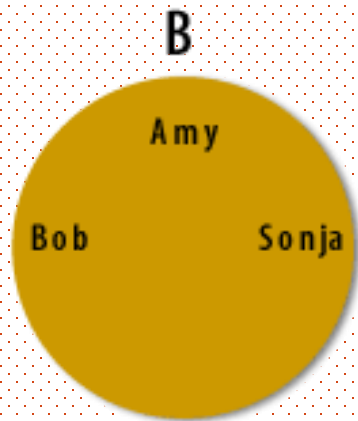
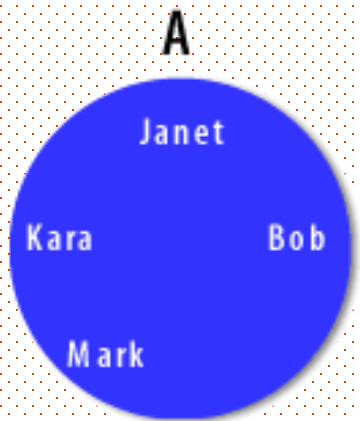
FISH	RAQAMI	YOSHI
Andrey Lunin	13	23
Nacho	6	32
Marselo	32	34
Eden Azar	7	31
Federiko Valverde	15	24
Kamavinga	25	20
Isko	22	30
Luka Yovich	16	25
Rodrigo	21	21





## 2. RELYATSION ALGEBRA VA UNING AMALLARI

**Birlashma (Union)** - bu ikkita jadval bo'yicha bajariladigan amal bo'lib, ikkita jadvalning barcha kortejlaridan iborat yangi jadval paydo bo'ladi.



```
select *from Real_asosiy
```

FISH	RAQAMI	YOSHI
Kazimiro	14	30
David Alaba	4	30
Ferlan Mendi	23	27
Vinisius Jr	20	22
Karim Benzema	9	35
Tibo Kutrua	1	30
Eder Militao	3	24
Dani Karvaxal	2	30
Toni Kross	8	32
Luka Modrich	10	37
Marco Asensio	11	28

```
select *from Real_zaxira
```

FISH	RAQAMI	YOSHI
Andrey Lunin	13	23
Nacho	6	32
Marselo	32	34
Eden Azar	7	31
Federiko Valverde	15	24
Kamavinga	25	20
Isko	22	30
Luka Yovich	16	25
Rodrigo	21	21

```
SELECT *FROM Real_asosiy
UNION
SELECT *FROM Real_zaxira
```

FISH	RAQAMI	YOSHI
Andrey Lunin	13	23
Dani Karvaxal	2	30
David Alaba	4	30
Eden Azar	7	31
Eder Militao	3	24
Federiko Valverde	15	24
Ferlan Mendi	23	27
Isko	22	30
Kamavinga	25	20
Karim Benzema	9	35
Kazimiro	14	30
Luka Modrich	10	37
Luka Yovich	16	25
Marco Asensio	11	28
Marselo	32	34
Nacho	6	32
Rodrigo	21	21
Tibo Kutrua	1	30
Toni Kross	8	32
Vinisius Jr	20	22

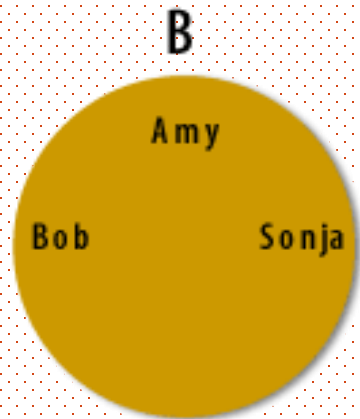
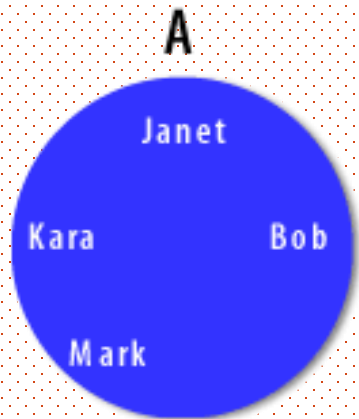






## 2. RELYATSION ALGEBRA VA UNING AMALLARI

**Birlashma (Union)** - bu ikkita jadval bo'yicha bajariladigan amal bo'lib, ikkita jadvalning barcha kortejlaridan iborat yangi jadval paydo bo'ladi.



```
SELECT fish FROM Real_asosiy  
UNION  
SELECT fish FROM Real_zaxira
```

FISH
Andrey Lunin
Dani Karvaxal
David Alaba
Eden Azar
Eder Militao
Federiko Valverde
Ferlan Mendi
Isko
Kamavinga
Karim Benzema
Kazimiro
Luka Modrich
Luka Yovich
Marco Asensio
Marselo
Nacho
Rodrigo
Tibo Kutrua
Toni Kross
Vinisius Jr

```
SELECT fish FROM Real_asosiy  
UNION  
SELECT yoshi FROM Real_zaxira
```

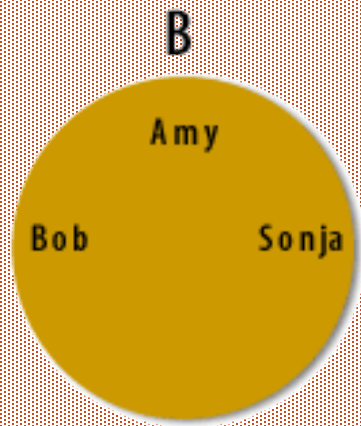
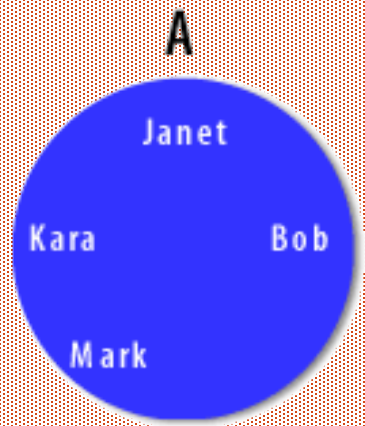
ORA-01790: expression must have same datatype as corresponding expression





## 2. RELYATSION ALGEBRA VA UNING AMALLARI

**Kesishma (Intersect)** - bu ikkita jadval ustida bajariladigan amal bo'lib, natijada ikkala asl jadvalga tegishli kortejlardan tashkil topgan yangi jadval paydo bo'ladi.



FISH	RAQAMI	YOSHI
Kazimiro	14	30
David Alaba	4	30
Ferlan Mendi	23	27
Vinisius Jr	20	22
Karim Benzema	9	35
Marselo	32	34
Tibo Kutrua	1	30
Eder Militao	3	24
Dani Karvaxal	2	30
Toni Kross	8	32
Luka Modrich	10	37
Aden Azar	7	31
Rodrigo	21	21
Marco Asensio	11	28
Federiko Valverde	15	24

FISH	RAQAMI	YOSHI
Andrey Lunin	13	23
Nacho	6	32
Marselo	32	34
Eden Azar	7	31
Federiko Valverde	15	24
Kamavinga	25	20
Isko	22	30
Luka Yovich	16	25
Rodrigo	21	21
Marco Asensio	11	28
Dani Karvaxal	2	30
Garet Bayl	18	33

```
SELECT *FROM Real_asosiy  
INTERSECT  
SELECT *FROM Real_zaxira
```

FISH	RAQAMI	YOSHI
Dani Karvaxal	2	30
Federiko Valverde	15	24
Marco Asensio	11	28
Marselo	32	34
Rodrigo	21	21





## 2. RELYATSION ALGEBRA VA UNING AMALLARI



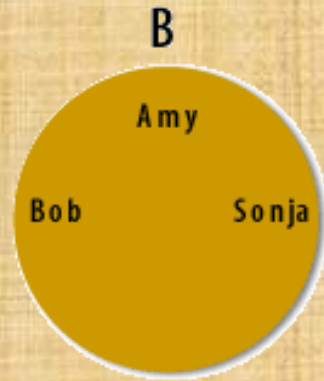
**Ayirma (Minus)** - bunda ikkita jadval ustida bajariladigan amal bo'lib, natijada birinchi va ikkinchi jadvalga tegishli bo'lmagan kortejlardan tashkil topgan yangi jadval paydo bo'ladi.

FISH	RAQAMI	YOSHI
Kazimiro	14	30
David Alaba	4	30
Ferlan Mendi	23	27
Vinisius Jr	20	22
Karim Benzema	9	35
Marselo	32	34
Tibo Kutrua	1	30
Eder Militao	3	24
Dani Karvaxal	2	30
Toni Kross	8	32
Luka Modrich	10	37
Aden Azar	7	31
Rodrigo	21	21
Marco Asensio	11	28
Federiko Valverde	15	24

```
SELECT *FROM Real_asosiy
MINUS
SELECT *FROM Real_zaxira
```

FISH	RAQAMI	YOSHI
Andrey Lunin	13	23
Nacho	6	32
Marselo	32	34
Eden Azar	7	31
Federiko Valverde	15	24
Kamavinga	25	20
Isko	22	30
Luka Yovich	16	25
Rodrigo	21	21
Marco Asensio	11	28
Dani Karvaxal	2	30
Garet Bayl	18	33

FISH	RAQAMI	YOSHI
Aden Azar	7	31
David Alaba	4	30
Eder Militao	3	24
Ferlan Mendi	23	27
Karim Benzema	9	35
Kazimiro	14	30
Luka Modrich	10	37
Tibo Kutrua	1	30
Toni Kross	8	32
Vinisius Jr	20	22





## 2. RELYATIONS ALGEBRA VA UNING AMALLARI



✓ **Dekart ko'paytma** - bu ikkita jadval bo'yicha amal bo'lib, natijada barcha mumkin bo'lgan kortejlardan tashkil topgan yangi munosabat paydo bo'ladi, ular dastlabki munosabatlar kortejlarining juft kombinatsiyasi hisoblanadi.

```
SELECT *FROM Real_asosiy natural join maosh
```

MAOSH_ID	MAOSH_DOLLAR	MAOSH_EURO
1	4000	3800
2	4800	4450
3	4800	4450
5	5000	4700
6	5500	5150
7	7000	6500
2	4500	4200

FISH	RAQAMI	YOSHI
Kazimiro	14	30
David Alaba	4	30
Ferlan Mendi	23	27
Vinisius Jr	20	22
Karim Benzema	9	35
Marselo	32	34
Tibo Kutrua	1	30
Eder Militao	3	24
Dani Karvaxal	2	30
Toni Kross	8	32
Luka Modrich	10	37
Aden Azar	7	31
Rodrigo	21	21
Marco Asensio	11	28
Federiko Valverde	15	24

FISH	RAQAMI	YOSHI	MAOSH_ID	MAOSH_DOLLAR	MAOSH_EURO
Kazimiro	14	30	1	4000	3800
David Alaba	4	30	1	4000	3800
Ferlan Mendi	23	27	1	4000	3800
Vinisius Jr	20	22	1	4000	3800
Karim Benzema	9	35	1	4000	3800
Marselo	32	34	1	4000	3800
Tibo Kutrua	1	30	1	4000	3800
Eder Militao	3	24	1	4000	3800
Dani Karvaxal	2	30	1	4000	3800
Toni Kross	8	32	1	4000	3800
Luka Modrich	10	37	1	4000	3800
Aden Azar	7	31	1	4000	3800
Rodrigo	21	21	1	4000	3800
Marco Asensio	11	28	1	4000	3800
Federiko Valverde	15	24	1	4000	3800
Kazimiro	14	30	2	4800	4450
David Alaba	4	30	2	4800	4450
Ferlan Mendi	23	27	2	4800	4450
Vinisius Jr	20	22	2	4800	4450
Karim Benzema	9	35	2	4800	4450
Marselo	32	34	2	4800	4450
Tibo Kutrua	1	30	2	4800	4450
Eder Militao	3	24	2	4800	4450
Dani Karvaxal	2	30	2	4800	4450
Toni Kross	8	32	2	4800	4450
Luka Modrich	10	37	2	4800	4450
Aden Azar	7	31	2	4800	4450





## 2. RELYATSION ALGEBRA VA UNING AMALLARI



**Tanlab olish (Selection)**- bu bitta jadvalning kortejlari bo'yicha amalga oshiriladi. Tanlov natijasi berilgan shartni qanoatlantiradigan asl munosabatning ma'lumotlaridan tashkil topgan yangi munosabatdir.

**Proyeksiya** - bu bir xil jadvaldagi kortejlarda bajariladi. Proyeksiyaning natijasi faqat dastlabki jadvalning belgilangan atributlarini o'z ichiga olgan yangi jadvaldir.

```
SELECT *FROM Real_asosiy  
WHERE yoshi>30
```

Results Explain Describe Saved SQL

FISH	RAQAMI	YOSHI
Karim Benzema	9	35
Marselo	32	34
Toni Kross	8	32
Luka Modrich	10	37
Aden Azar	7	31

```
SELECT DISTINCT fish FROM Real_asosiy
```

Results Explain Describe Saved SQL History

FISH
Marselo
Rodrigo
Marco Asensio
Karim Benzema
Eder Militao
Dani Karvaxal
Aden Azar
Kazimiro
Ferlan Mendi
David Alaba
Vinisius Jr
Luka Modrich
Federiko Valverde
Toni Kross
Tibo Kutrua





## 2. RELYATSION ALGEBRA VA UNING AMALLARI

➤ **Birikma (Соединение)**- bu umumiy atributlarga ega bo'lgan ikkita munosabat bo'yicha amal bo'lib, natijada asl jadvallarning barcha atributlaridan iborat yangi jadval paydo bo'ladi.

```
SELECT Real_zaxira.fut_id, Real_zaxira.fish,
Real_zaxira.raqami, Pozitsiya.Pozitsiyasi
FROM Real_zaxira, Pozitsiya
WHERE Real_zaxira.fut_id= Pozitsiya.fut_id
```

```
SELECT *FROM Real_zaxira
```

Results Explain Describe Saved SQL History

FISH	RAQAMI	YOSHI	FUT_ID
Andrey Lunin	13	23	1
Nacho	6	32	2
Marselo	32	34	3
Eden Azar	7	31	4
Federiko Valverde	15	24	5
Kamavinga	25	20	6
Isko	22	30	7
Luka Yovich	16	25	8
Rodrigo	21	21	9
Marco Asensio	11	28	10
Dani Karvaxal	2	30	11
Garet Bayl	18	33	12

```
SELECT *FROM Pozitsiya
```

Results Explain Describe

FUT_ID	POZITSIYASI
1	Varatar
2	Markaziy himoyachi
4	Markaziy hujumchi
2	Qanot himoyachi
3	Qanot himoyachi
4	Yarim himoyachi
4	Qanot hujumchisi

FUT_ID	FISH	RAQAMI	POZITSIYASI
1	Andrey Lunin	13	Varatar
2	Nacho	6	Qanot himoyachi
2	Nacho	6	Markaziy himoyachi
3	Marselo	32	Qanot himoyachi
4	Eden Azar	7	Qanot hujumchisi
4	Eden Azar	7	Yarim himoyachi
4	Eden Azar	7	Markaziy hujumchi





### 3. RELYATSION HISOBLASH VA UNING ELEMENTLARI

**Relyatsion hisoblash** – bu relyatsion algebradan farqli o'laroq, protsessual bo'lmagan so'rovlar tilidir, ya'ni u nima qilish kerakligini aytadi, lekin buni qanday qilishni tushuntirmaydi.

Relyatsion hisob ikki shaklda mavjud :

➤ **Tuple relational Calculus (TRC)** – bu o'zgaruvchilar diapazonlarini kortejlar bo'yicha filtrlash.

$T$  – vaziyat. Shartni qondiradigan barcha  $T$  kortejlarini qaytaradi.

Masalan:

**$\{ T.name \mid Author(T) AND T.article = 'database' \}$**

**Natija.** “Ma'lumotlar bazasi” da bazani yaratgan muallifning “nomi” bilan kortejlarni qaytaradi.





### 3. RELYATSION HISOBLASH VA UNING ELEMENTLARI

**Domain Relational Calculus (DRC)** – bu filtrlovchi o'zgaruvchi butun kortej qiymatlari o'rniga atributlar domenini ishlatadi.

$$\{ a_1, a_2, a_3, \dots, a_n \mid P(a_1, a_2, a_3, \dots, a_n) \}$$

Bu yerda  $a_1, a_2$  atributlar,  $P$  esa ichki atributlar asosida tuzilgan formulalarni bildiradi.

**Masalan:**

$$\{ \langle article, page, subject \rangle \mid \in TutoriasPoint \wedge subject = 'database' \}$$

**Natija.** *TutoriasPoint* aloqasidan sahifa va mavzuni haqida ma'lumot chiqaradi, bu yerda mavzu ma'lumotlar bazasi hisoblanadi.

Xuddi TRC kabi, DRC ham universal kvantlar yordamida yozilishi mumkin. DRC aloqa operatorlarini ham o'z ichiga oladi.







# NAZORAT SAVOLLARI:

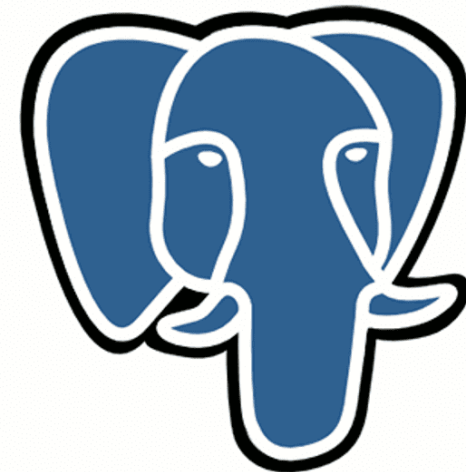
- ✓ Relyatsion ma'lumotlar bazasini asosiy tushunchalari.
- ✓ Munosabat xossalari qanday?
- ✓ Munosabatlar sxemasiga misollar keltiring.
- ✓ Relyatsion algebra amallarini aytib o'ting.
- ✓ Relyatsion hisoblash amallarini ayting va misol keltiring.



# DATABASE

E'TIBORINGIZ UCHUN  
RAHMAT!

THANKS



PostgreSQL

