(/) division.

E – enrollment

C – Course.

$\pi_{Sid,Cid}^{(E)} / \pi_{Cid}^{(C)}$

$\pi_{Sid}^{(E)} - \pi_{Sid}\left(\left(\pi_{Sid}^{(E)} \times \pi_{Cid}^{(C)}\right) - \pi_{Sid,Cid}^{(E)}\right)$

Students who registed in all the Course

Students who have not registered in a ~~particular course~~ all courses

Students who have not registered in a particular Course.

Division can be expressed using following operators

$\pi, \times, -$

Ex:

$\pi(R)$ AB

a_1	b_1
a_1	b_2
a_1	b_3
a_2	b_2
a_2	b_3

$\pi(S)$ B

b_1
b_2
b_3

$= a_1$

$\pi_{AB}(R) / \pi_{B}(S) =$

$\pi_{A}(R) - \pi_{A}(\pi_{A}(R) \times \pi_{B}(S) - \pi_{AB}(R))$

✓ just read it but don't

$\pi_{ABCD}(R) / \pi_{CD}(S)$ ✓ ✓

a_1	b_1	c_1	d_1
a_1	b_1	c_2	d_2
a_1	b_2	c_1	d_3 ✓

c_1	d_1
c_2	d_2

A	B
a_1	b_1

Quotient in gate.

$$\pi_{AB}(R) - \pi_{AB}\left(\pi_{(AB)}^{R} \times \pi_{CD}^{(S)} - \pi_{ABCD}^{(R)}\right)$$

Enroll(Sid Cid) Course(Cid, Instr)

Retrieve Sids who enrolled for some course taught by KORTH.

Enroll(Sid Cid) Course(CID, instr)

S_1	C_1
S_1	C_2
S_1	C_3
S_1	C_5
S_2	C_2
S_2	C_5
S_3	C_4

C_1	Korth
C_2	Korth
C_3	Korth
C_4	navathe
C_5	ullman

$\pi_{enroll.cid}\left(\left(enroll \times \sigma_{instr = Korth}(Course)\right)\right)$

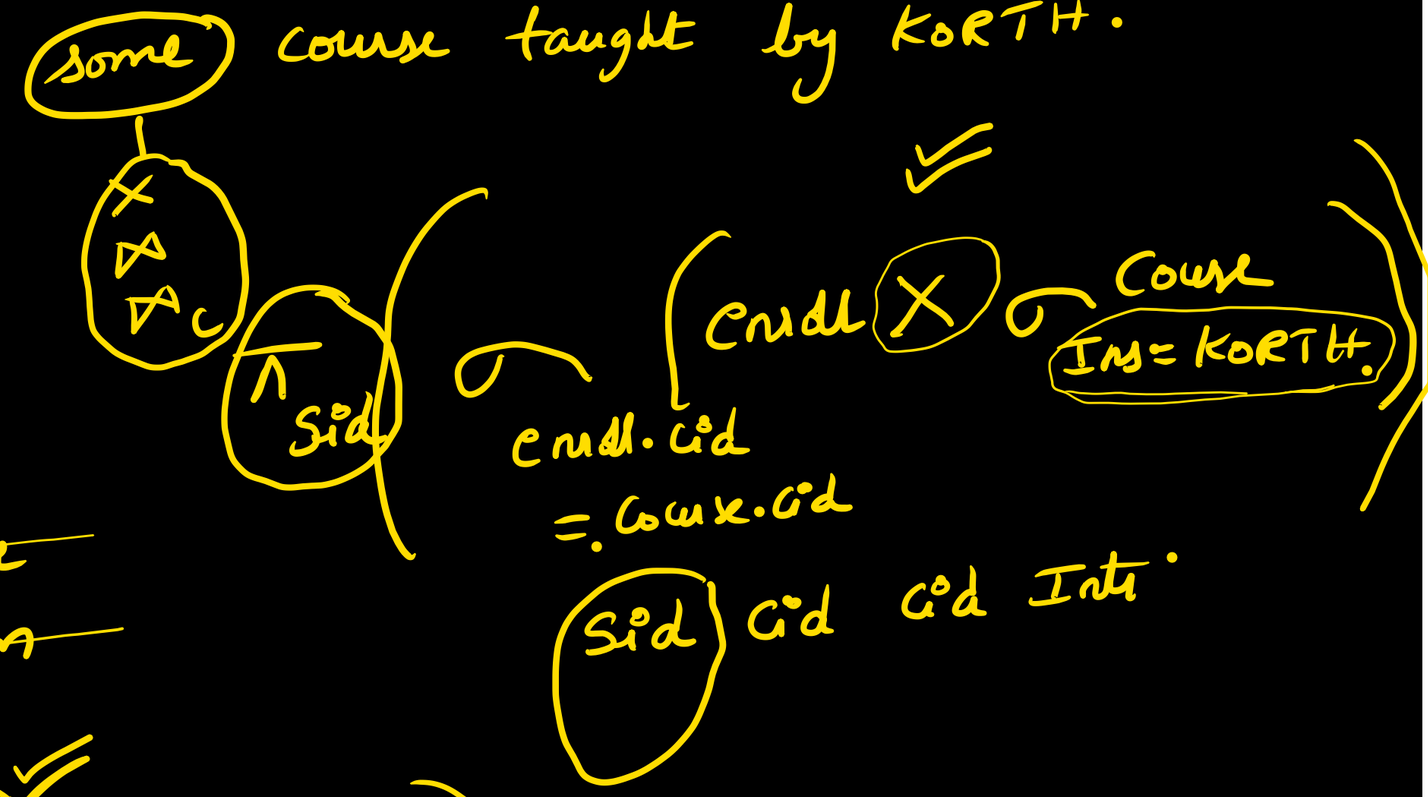
$enroll.cid = course.cid$

Enroll(Sid Cid) Course(Cid, Instr)

Retrieve Sids who enrolled for some course taught by KORTH.

Enroll(Sid Cid) Course(CID, Instr)

S_1	C_1	C_1	KORTH
S_1	C_2	C_2	KORTH
S_1	C_3	C_3	KORTH
S_1	C_5	~~C_4~~	~~NAVATHE~~
S_2	C_2	~~C_5~~	~~ULLMAN~~
S_2	C_5		
S_3	C_4		



$$\Pi_{Sid}(Enroll \bowtie \sigma_{Instr = KORTH}(Course))$$

Retrieve Sid's of students who enrolled for **every** course taught by by Korth

Enroll

Sid	Cid
S_1	C_1
S_1	C_2
S_1	C_3
S_1	C_5
S_2	C_2
S_2	C_5
S_3	C_4

Course

Cid	Inst
C_1	Korth
C_2	Korth
C_3	Korth
C_4	Navathe
C_5	Ullman

$\pi_{Sid,Cid}(E)$ / $\pi_{(\sigma\ Course)}$

Cid Inst = Korth

Sid	Cid
S_1	C_1

$$\pi_{Sid}^{Enroll} - \Big(\pi_{Sid}^{Enroll} \times \pi_{Cid}^{(\sigma\ Course\ inst=Korth)} - \pi_{Sid,Cid}^{Enroll}\Big)$$

- π_{Sid}^{Enroll}: All the students who have enroll in all courses of Korth
- π_{Sid}: All students who have not registered for all Korth courses.
- $\pi_{Sid}^{Enroll} \times \pi_{Cid}^{(\sigma\ Course\ inst=Korth)}$: Every possible registration of Korth Courses
- $\pi_{Sid,Cid}^{Enroll}$

If works for (Eid, Pid.)..... Project (Pid, Pname)..... .

→ Retrieve Eid's who work for ~~some~~ every DB project.

works for

Eid	Pid
e_1	p_1
e_1	p_2
e_1	p_3
e_2	p_2
e_2	p_3
e_3	p_3

Project

Pid	Pname
p_1	DB
p_2	DB
p_3	OS
p_4	ADBMS

e_1 ✓

$$\pi_{eid,pid}(works\ for) \;/\; \pi_{pid}(\sigma_{Pname=DB}\ project)$$

$$\pi^{(\omega)}_{eid} - \pi_{eid}\left(\left(\pi^{(\omega)}_{eid} \times \pi_{pid}\left(\sigma^{p}_{name=DB}\right)\right) - \pi_{eid,pid}\right)$$

Set operators:

Union: $\cup$

Set difference: $-$

Intersection: $\cap$

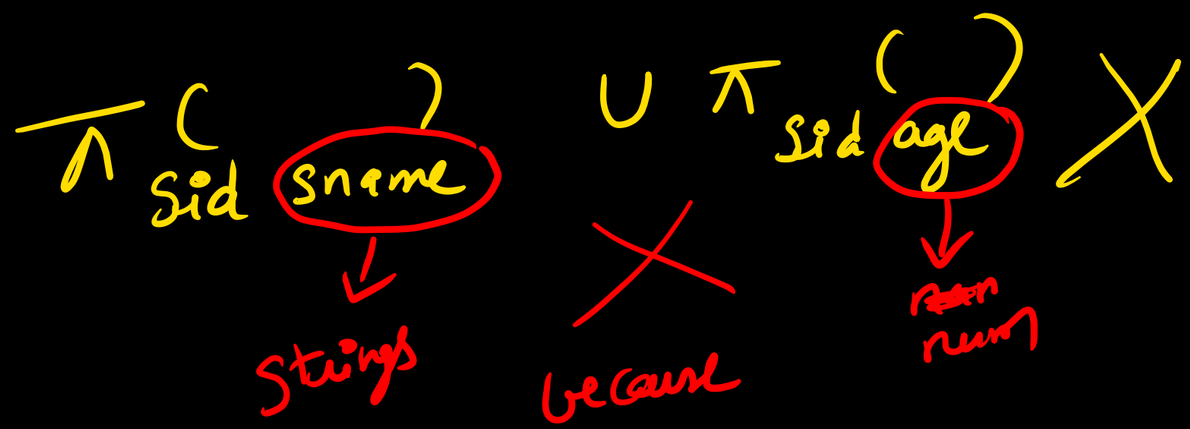
→ To apply $R \cup S$, $R - S$, $R \cap S$, relations ~~should~~ R and S must be union compatable.

R and S are union compatible iff

a) Arity of R = Arity of S [Arity is no of attributes]

b) Domain of each attribute of 'R' must be same as attributes of 'S'.

$\pi_{Sid\ Sname}(\ ) \cup \pi_{Stuid\ Stuname}$.


π
(sid, sname)
strings
∪
π
(sid, age)
num
X
because

R ∪ S, R ∩ S, R − S

(i) The schema of all above results is same as 'R'

(ii) Resultant record set is distinct record table

Result table

Result → no duplicates

R

A	B	C
2	4	6
3	5	7
3	5	7
4	5	6

S

D	E	F
2	4	6
2	4	6
4	5	6
3	5	9

R-S

R

A	B	C
3	5	7

$R \cup S =$

R

A	B	C
2	4	6
3	5	7
4	5	6
3	5	9

$R \cap S = R$

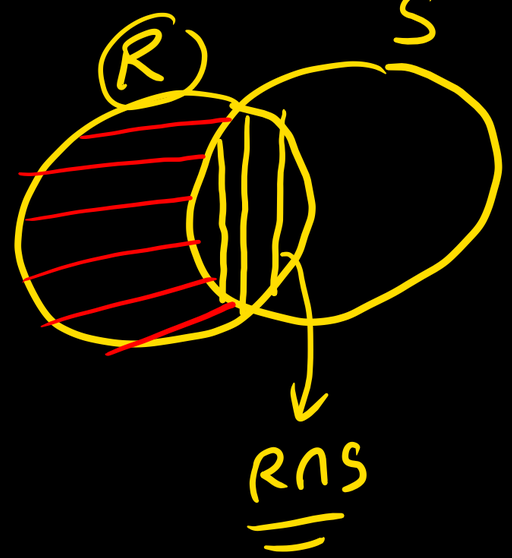
A	B	C
2	4	6
4	5	6

In a table, RA allows duplicate
But result of any operation should
not contain duplicates.

$\cup$, $-$ $\Rightarrow$ basic operations

$\cap$ $\Rightarrow$ derived operation

$R \cap S = R - (R - S)$



$R(A,B)$ $S(A,B)$

Attribute names of R and S are same:

1) $R \cap S = R-(R-S)$

2) $R \cap S = R \bowtie S$, if attribute names are same

R

A	B
4	6
2	5

S

A	B
4	6
2	8

$R \cap S$

A	B
4	6

$R \bowtie S =$ R

A	B
4	6

(iii) $R \cup S = R \bowtie S$

R

A	B
4	6
2	5

S

A	B
4	6
2	8

$R \cup S = R$

A	B
4	6
2	5
2	8

$R \bowtie S$

A	B
4	6
2	5
2	8

$R(AB)$ $S(CD)$ → names are not same

(i) $R \cap S = R - (R - S)$ ✓

(ii) $R \bowtie S \neq R \cap S$ ∵ ∵ R AB

$R \times S$

A	B	C	D

use can change the names of attributes and apply natural join which is equal to intersection.

(iii) $R \cap S = R \bowtie \rho(S)$.

$C \to A$
$D \to B$ }

$R \div S \neq R \bowtie S$ (when attribute names are not same)

But we can change names and make them equal

$$R \div S = R \bowtie \rho_{C \to A,\ D \to B}(S)$$ ✓

$$\pi_{(AB)}(R) \div \pi_{(B)} S \equiv \pi_A(R) - \pi_A\left(\pi_A(R) \times \pi_B(S) - \pi_{AB} R\right)$$ ✓

$\pi_A(R)$ and $\pi_A(\ldots)$: union compatible

$\pi_A(R) \times \pi_B(S)$ and $\pi_{AB} R$: union compatible

Queries by using Set operation:

Common data:

Stud (Sid Sname age)

Sid	Sname	age
S_1	A	-
S_2	B	-
S_3	C	-
S_4	D	-

Course =

Cid	Cname	Inst
C_1	DB	Kalth
C_2	DB	Kalth
C_3	DB	Navathe
C_4	CO	Navathe
C_5	OS	galvin

Enrdl =

Sid	Cid	fee
S_1	C_1	-
S_1	C_2	-
S_1	C_3	-
S_1	C_4	-
S_2	C_1	-
S_2	C_2	-
S_1	C_5	-
S_3	C_3	-
S_4	C_5	-

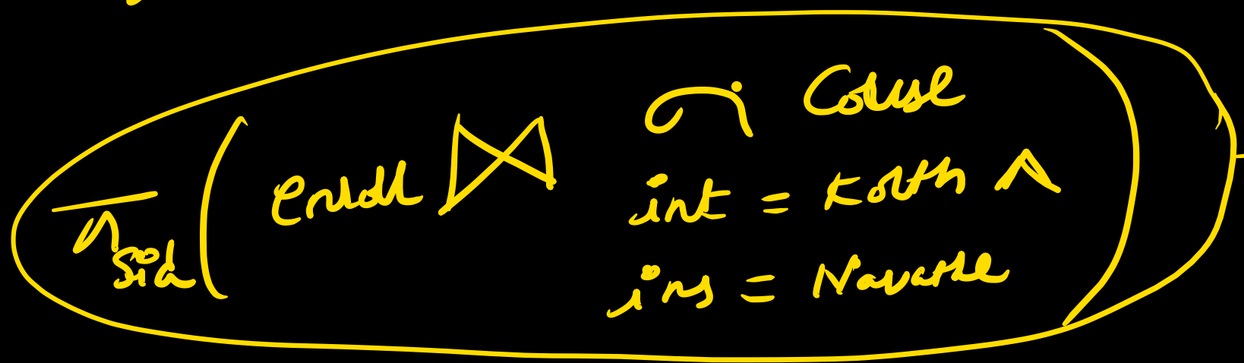
Retrieve Sids enrolled for some course taught by Kotth or some course taught by navathe

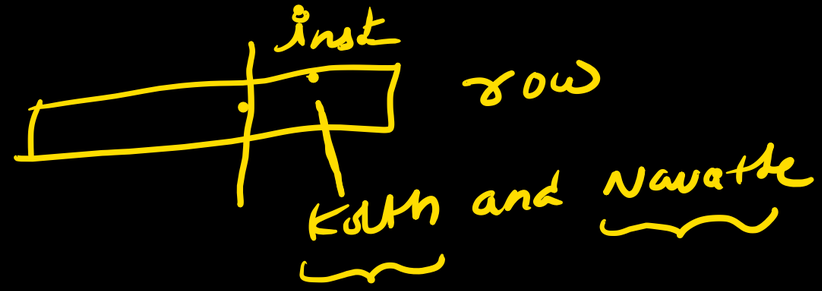
$$\pi_{Sid}\left(\text{enroll} \bowtie \sigma_{Instr = Kotth \vee Instr = navathe}(\text{course})\right)$$

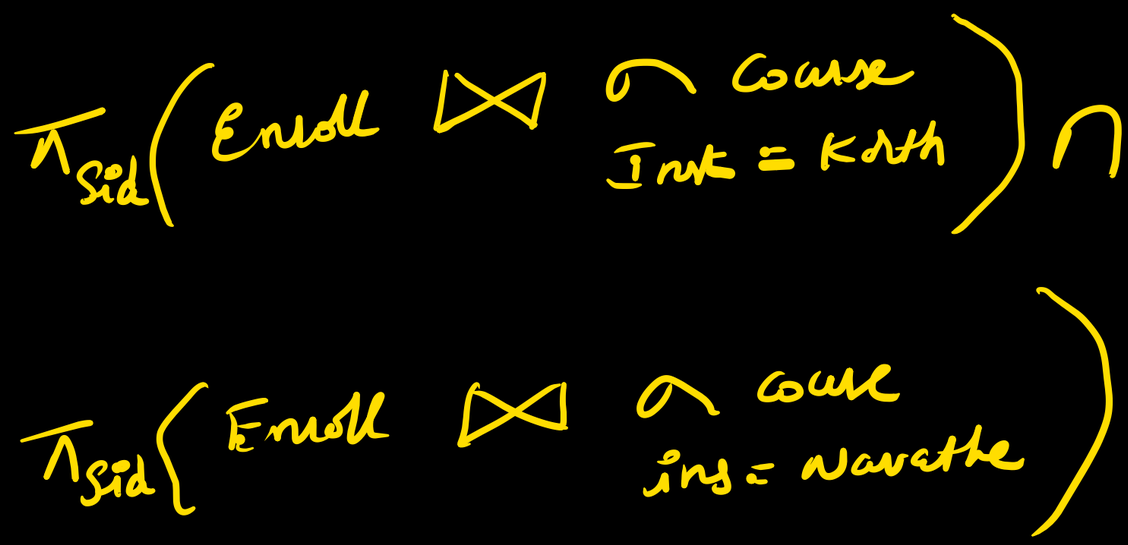
(or)

$$\pi_{Sid}\left(\text{Enroll} \bowtie \sigma_{inst = Kotth}(\text{Course})\right) \cup \pi_{Sid}\left(\text{Enroll} \bowtie \sigma_{inst = navathe}(\text{Course})\right)$$

Retrieve sids enrolled for some course taught by Keith and some course taught by Navathe?






π sid
Enroll
course
Inst = Kath
π sid
Enroll
course
ins = Navathe

Retrieve Sid who enrolled in **only** courses taught by Kolth

Emp

Sid	Cid
S_1	C_1
S_1	C_2
S_1	C_4
S_2	C_2
S_3	C_1
S_3	C_2
S_4	C_5

Course

Cid	Inst
C_1	Kolth
C_2	Kolth
C_3	Navathe
C_3	Navathe
C_5	Ullman

{Sid enrolled in Stud} − {Sid enrolled in some non Kolth course}

$$\pi_{Sid}(Enrld) - \pi_{Sid}\left(Enrld \bowtie \sigma_{Inst \neq Kolth}(Course)\right)$$

Only → −

Enroll (Sid, Cid) Course (Cid, Insti)

Retrieve sids enrolled by some course taught by Korth.

$$\pi_{Sid}\left(Enroll \bowtie \sigma_{ins = Korth}(Course)\right)$$

one - DBMS - 1hr.
Algo - 1hr.
C pr - 2hr.
} Next - Friday

Jay Bansal → C program from monday.

Friday - I - DBMS, Jay - C program.