π : projection

ρ : Rename

σ : selection

→ Simple questions

$\times$: Cross product

$\cup$: union

$-$: Set difference

$\bowtie$ - Join

$\cap$ - intersection

$/$ - division.

→ Medium level questions.

X

R

A	B	C

S

C	D

R X S

A	B	C	C	D

R ⋈ S

A	B	C	D

distinct attributes

↓

no repetition

Conditional join $\bowtie_C$

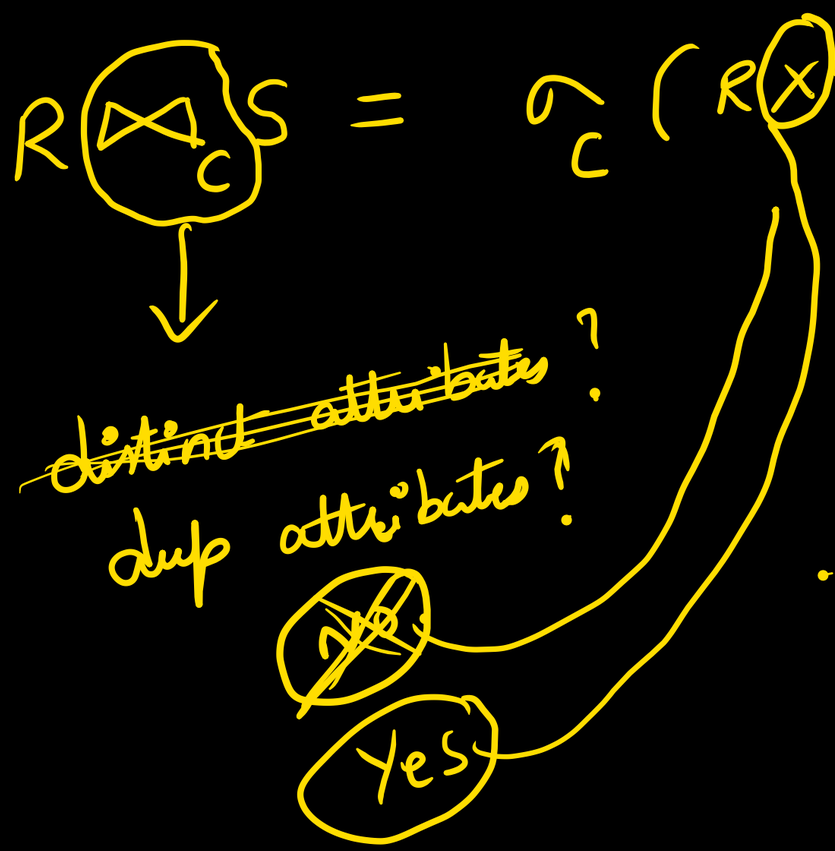
$R(A\,B\,C)$ $S(B\,C\,D)$

$R \bowtie S$ $A\,B\,C\,D$

$R \bowtie_C S$ $A\,B\,C\,B\,C\,D$

$R \bowtie_C S = \sigma_C(R \times S)$

allows dup attributes because of the $\times$



$\therefore$ $\times$ → Cross product — dup allowed

$\bowtie$ → natural join — dup not allowed

$\bowtie_C$ → Conditional join — dup allowed.

$R \bowtie_{R.C > S.C} S = \sigma_{R.C > S.C}(R \times S)$ ✓

R

A	B	C
4	2	5
6	5	8
3	4	5

S

C	D
5	7
7	8

$R \times S$

A	B	C	C	D
4	2	5	× 5	7
4	2	5	× 7	8
6	5	8	✓ 5	7
6	5	8	✓ 7	8
3	4	5	× 5	7
3	4	5	× 7	8

output:

A	B	C	C	D
6	5	8	5	7
6	5	8	7	8

Same ex:

$R \bowtie S$ → when condition is not given, then it is natural join

$\Pi_{\text{dist attributes}}(\sigma_{\text{Common attribute equality}}(R \times S))$

Common attribute = C on C equality

A	B	C	C	D	
4	2	5	— 5	7	✓
4	2	5	× 7	8	
6	5	8	× 5	7	
6	5	8	× 7	8	
3	4	5	— 5	7	✓
3	4	5	× 7	8	

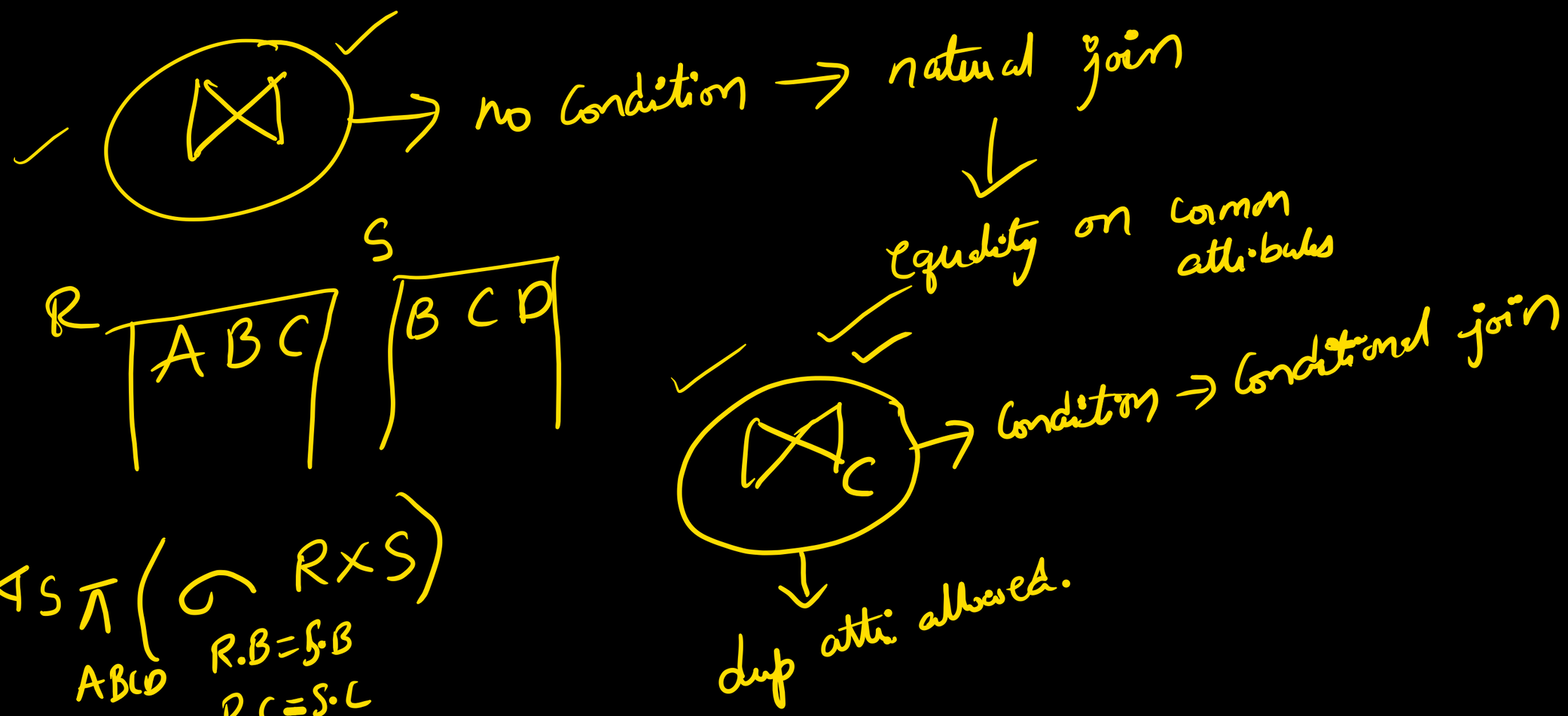
R

A	B	C
4	2	5
6	5	8
3	4	5

S

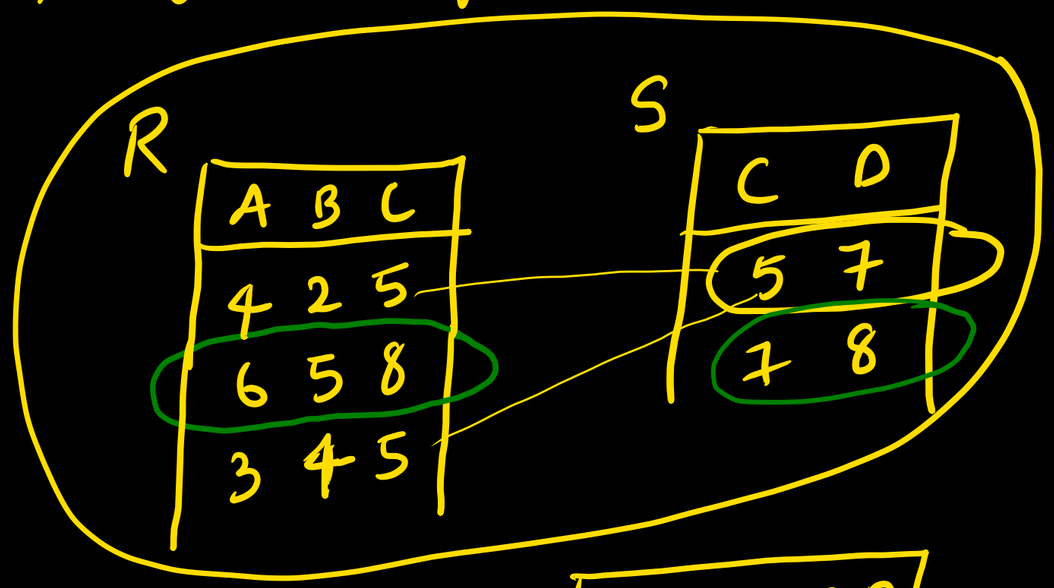
C	D
5	7
7	8

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


no Condition → natural join
equality on common attributes
Condition → Conditional join
dup attr allowed.
R
A B C
S
B C D
R ⋈ S
π
A B C D
σ
R.B = S.B
R.C = S.C
R × S

Outer join:

1) left outer join $R \overset{L}{\bowtie} S$ = $R \bowtie S$ ∪ (Records of R which failed join condition



(for Left table, add the missing rows.

for $R \overset{L}{\bowtie} S$

A	B	C	D
4	2	5	7
3	4	5	7
6	5	8	null
N	N	7	8

$R \bowtie S$

A	B	C	D
4	2	5	7
3	4	5	7
6	5	8	null

✓

② Right outer join:

$R \overset{R}{\bowtie} S$ = $R \bowtie S$ ∪ Records of S which failed join condition.

~~A B C~~

Full outer join:

$$R \left(\overline{\bowtie}\right) S = (R \overline{\bowtie} S) \cup R \left(\overline{\bowtie}\right) S)$$

Conditioned left join:

$R \ltimes_C S$ → dup are allowed.

Same as left outer join

$R \ltimes_C S$ contains { Rows of R failed in the condition }

R

A	B	C
4	2	5
6	5	8
3	4	5

S

C	D
5	7
7	8

$R \ltimes S$

$R.C > S.C$

A	B	C	C	D
6	5	8	5	7
6	5	8	7	8
4	2	5	N	N
3	4	5	N	N

5 min break:

Conditional right join:

$$R \overset{R}{\bowtie}_{c} S = R \bowtie_{c} S \cup \{\text{Row of 'S' fail in join condition}\}$$

R

A	B	C
4	2	5
6	5	8
3	4	5

S

C	D
5	7
7	8

$R \overset{R}{\bowtie} S$, $R.C < S.C$

A	B	C	C	D
4	2	5	5	7
			7	8
3	4	5	7	8
N	N	N	5	7

Condition outer join

$R \overset{}{\bowtie}_{C} S$

Join queries :

These ques are easy to solve in exam

Difficult to understant I time

So I will do two times.

Join queries: → when two tables needed to be joined

R(A.....) S(B.....). Retrieve 'A' values of R which are more than some 'B' values of 'S'.

→ any / atleast 1

R

A
10
20
30
40

S

B
15
25
40

Out

ans
20
30
40

more than some
more than any
more than atleast 1

hint.

$R \bowtie S$

$R \bowtie_C S$

$\sigma_C(R \times S)$

$$\pi_A\left(\sigma_{R.A>S.B}(R \times S)\right)$$

$$\pi_A(R \bowtie_{R.A>S.B} S)$$

$\bowtie$ natural

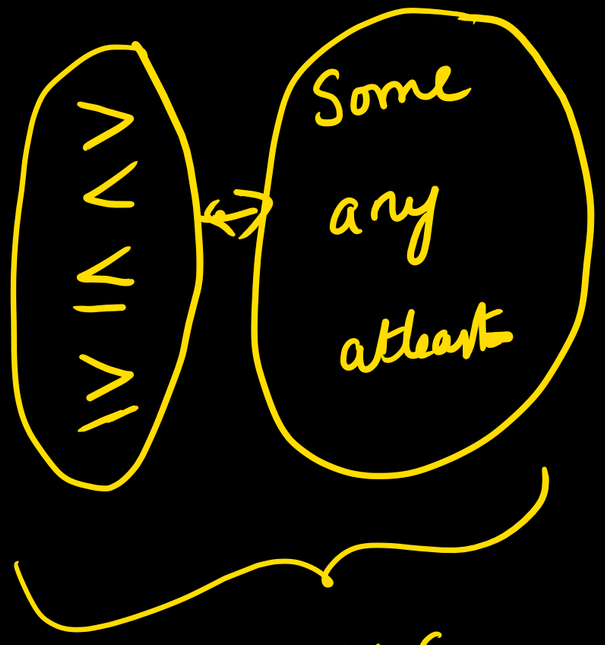
X $\overline{\bowtie}$

A	B
1	2

B	D
3	4

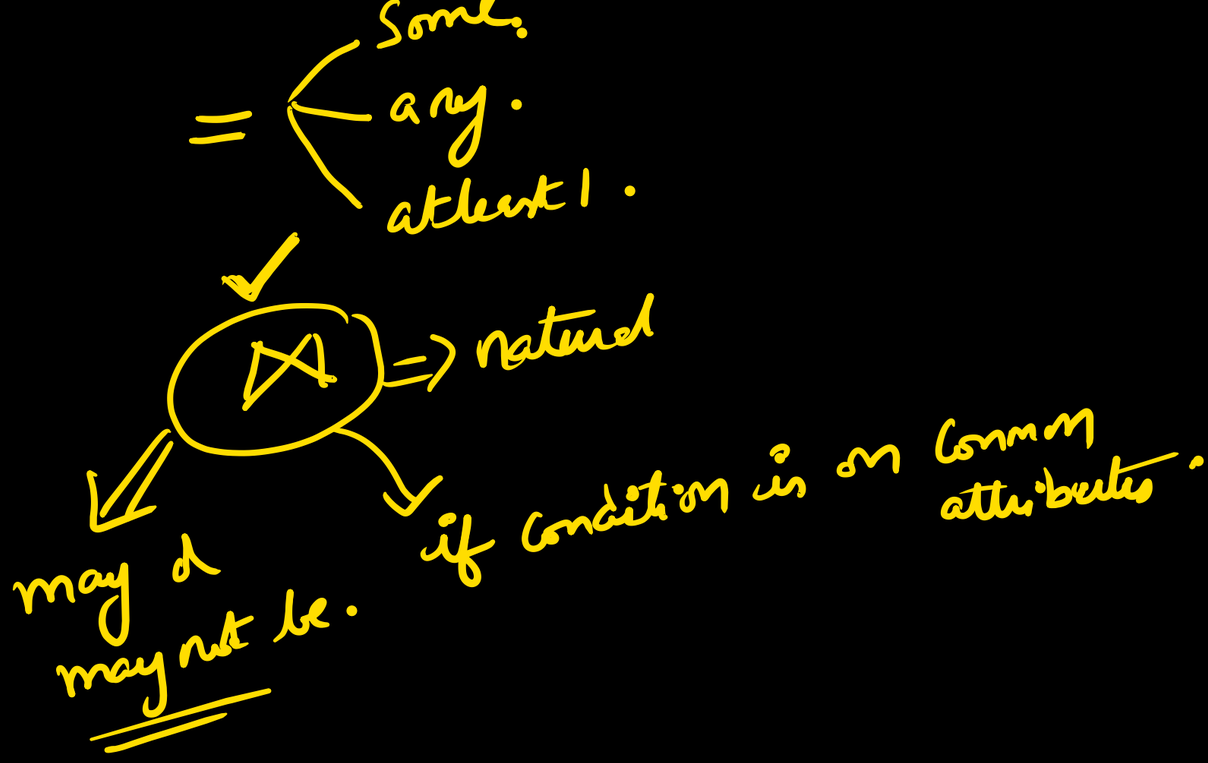
$\times$

A	B	C	D
1	2	3	4
...			



$\sigma_C(R \times S)$

> Some
< Some
> any
< any

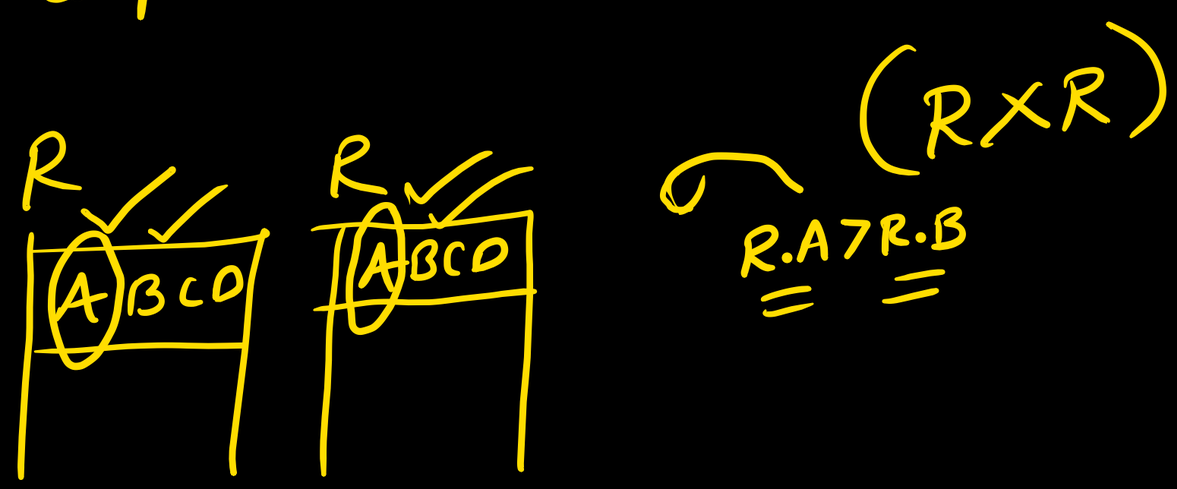


Rename C:

Used to rename table name & attribute names

If we compare R with S, then no renaming is needed.

If we compare R with R then renaming is needed.



We can rename tables & of attributes of both

Stud (Sid, Sname, age)

ρ (Temp, Stud) $\Rightarrow$ Temp

Sid	Sname	age

$\rho_{I, N, A}$ (Stud) $\Rightarrow$

Stud

I	N	A

Sid → I

Sname → N

Age ~~Attr~~ → A

S (Stud)

Sid → I

Age → A

Stud (Sid, Sname, age)

Stud (I, Sname, A)

Table ✓

attributes ✓

Some of the attributes ✓

Just try to answer:

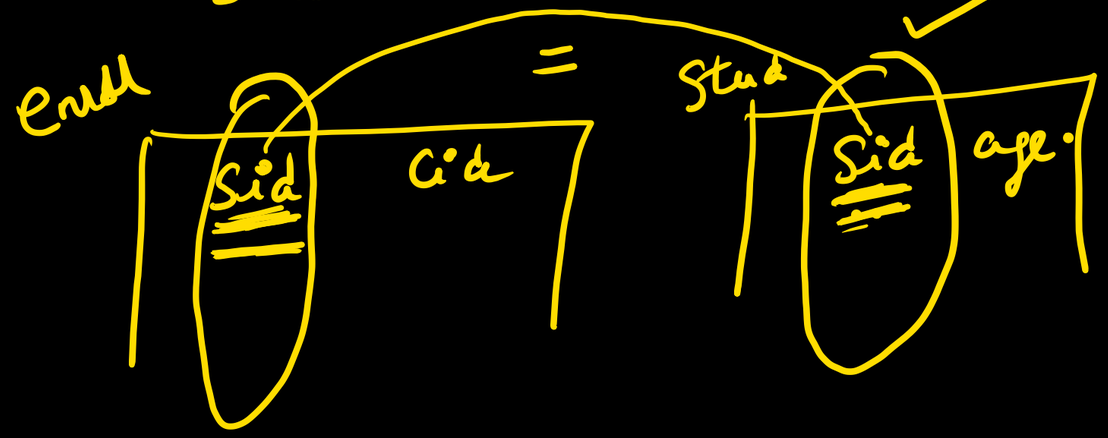
Enroll ($\check{Sid}$, $\check{cid}$) Stud ($\check{Sid}$, $\check{age}$)

$\pi_{Stud.Sid}\left(\sigma_{Stud.Sid = Enroll.Sid}\left(Stud \times Enroll\right)\right) \Leftrightarrow \pi_{Stud.Sid}\left(Stud \bowtie Enroll\right)$

Students who enrolled in some course

= any

at least one



Emp(eid, sal, gender)

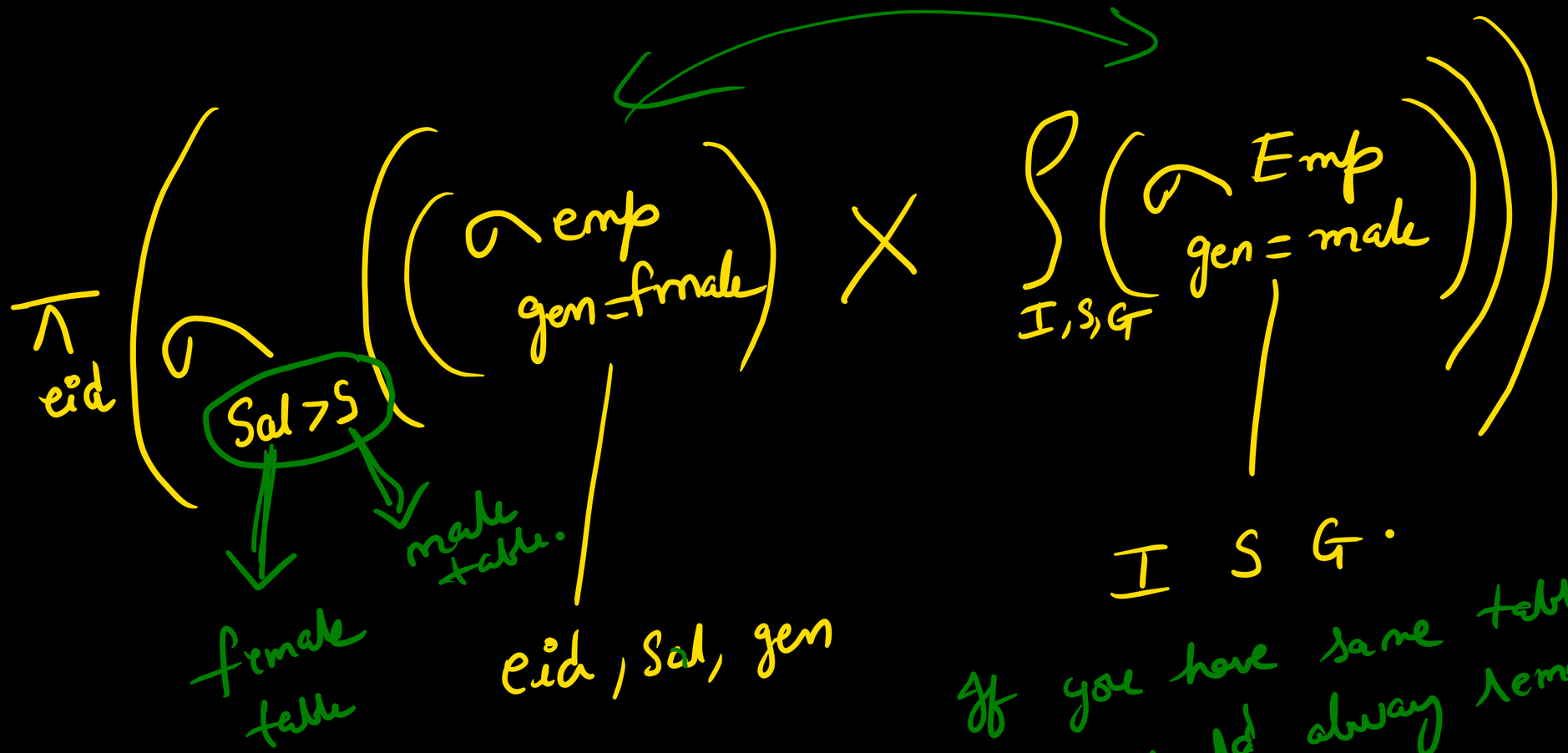
Retrieve female emp id where sal is more than salary of some male employee.

Emp(eid, sal, gen) ✓
↓
female ✓

Emp(eid, sal, gen) ✓
↓
male ✓

$$\Pi_{eid}\left(\sigma_{gen=female}(Emp) \bowtie_{sal>S} \left(\sigma_{gen=male}(Emp)\right)\right)$$

I, S, G



I S G:

If you have same table we should always rename one of them

Emp(eid, sal, dno)

Retrieve eids whose sal more than sal of some dept:5 employee.

Emp(eid, sal, dno) ρ Emp(eid, sal, dno)

$I_1 S_1 D_1 \xi^5$

$\bowtie_C$

$\bowtie$

$\sigma \times$

all 5.

eid	dep
1	100
2	
3	
4	50
5	

$\Pi_{Eid}\left(\text{Emp} \bowtie_{Sal > S} \text{ISO}\left(\sigma_{dno=5}(\rho_{(Emp)})\right)\right)$

we can use cross product also.

Eg Stud(sid, age) Dept(did, age)

Retrieve sid of students whose age more than age of some department

$\pi_{sid.}$ (Stud $\bowtie_{Stud.age > Dept.age}$ Dept)

π_{A} (A $\bowtie_{S.A > s.B}$ B)

any / some attribute.