

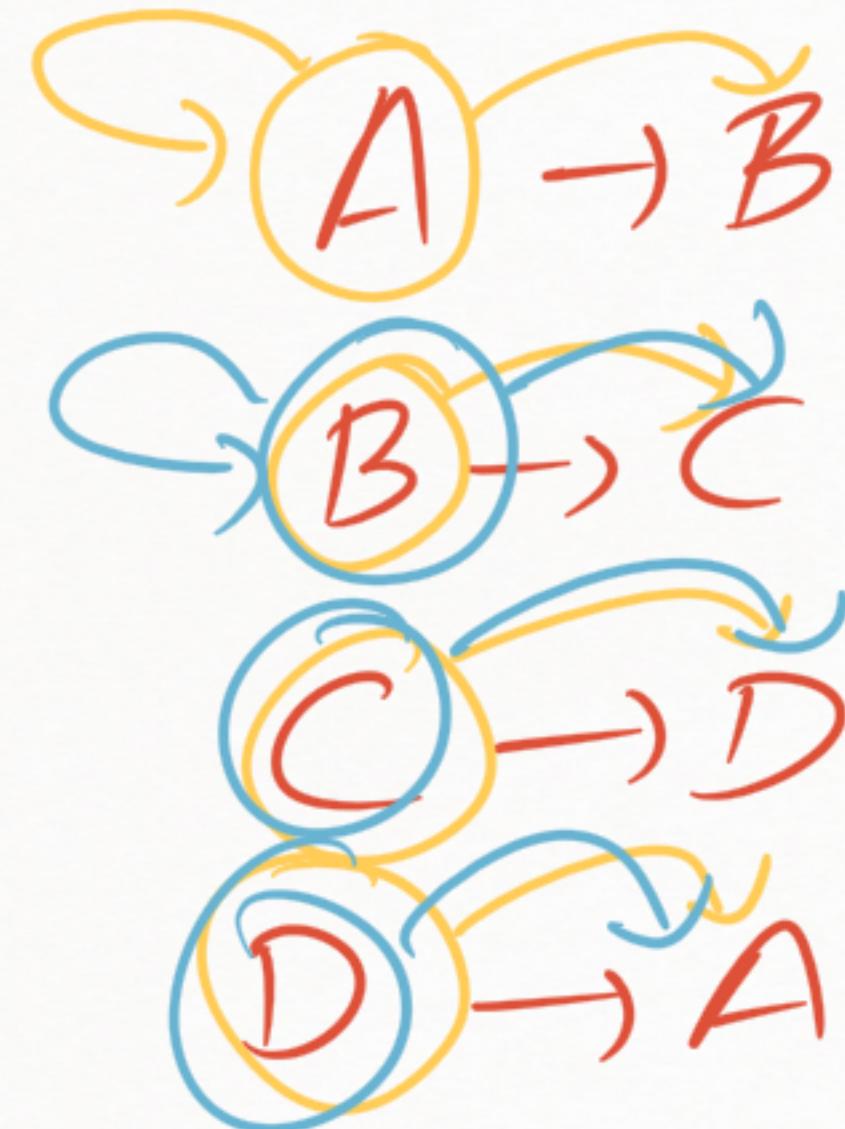
Functional Dependencies

A	B
a a	1 2 3 4
b	

① $A \rightarrow B \times$
② $B \rightarrow A$
IDK

Which one of them is wrong? \Rightarrow ①
 \Rightarrow If something repeats in X then it
should also repeat in Y, When $\underline{X \rightarrow Y}$

A	B	C	D



$$A^+ = \{ \bar{A}, B, C, D \} \checkmark$$

$$B^+ = \{ \bar{B}, C, D, A \} \checkmark$$

$$C^+ = \{ \bar{C}, D, A, B \} \checkmark$$

$$D^+ = \{ A, B, C, \bar{D} \} \checkmark$$

$$C_k = A, B, C, D$$

Can we have more C_k in this case?

No

C_k Note \Rightarrow It has to be minimal

AB?

CD?

ABC?

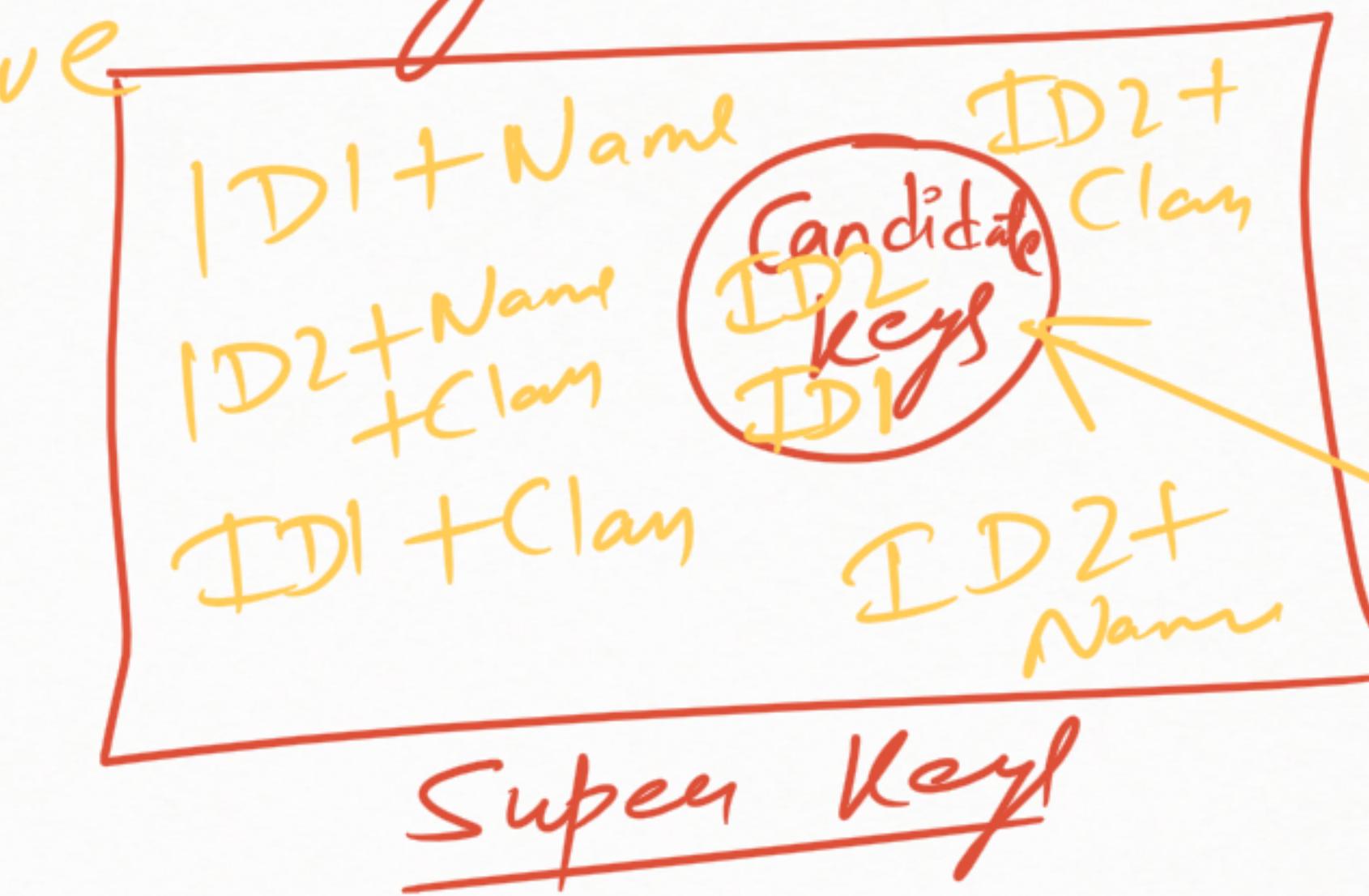
NO

Super Key = Candidate Key + Waste

Waste is 0

\Rightarrow Every Candidate key is a Super key

\Rightarrow Every super key is a candidate key. FALSE

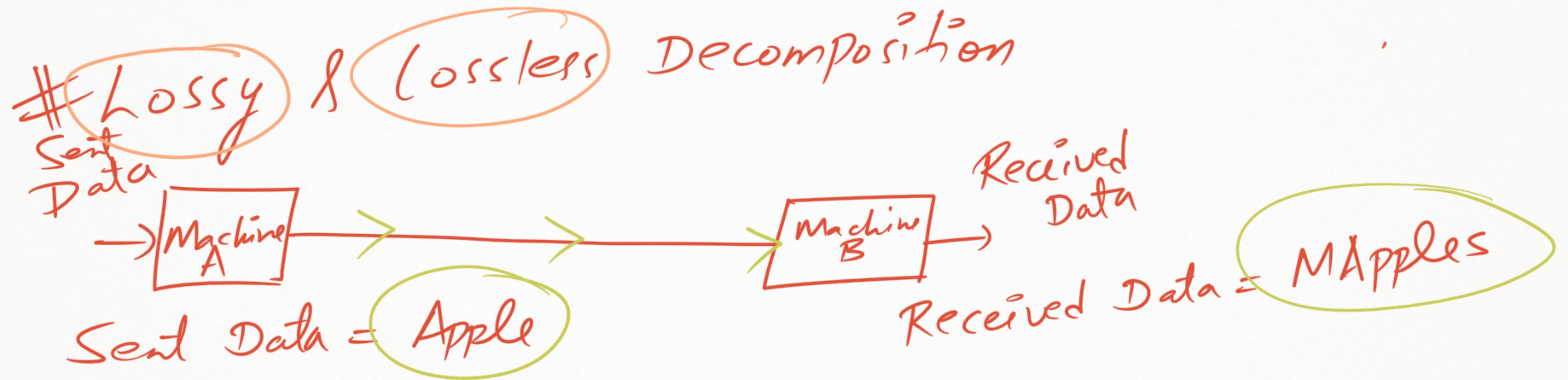


ID1	ID2	Name	Class

↑↑↑↑
represents

$$C_k = ID_1, ID_2$$

Candidate keys



Q1. Is information lost?

Yes / No

From Pushkar S to Everyone:

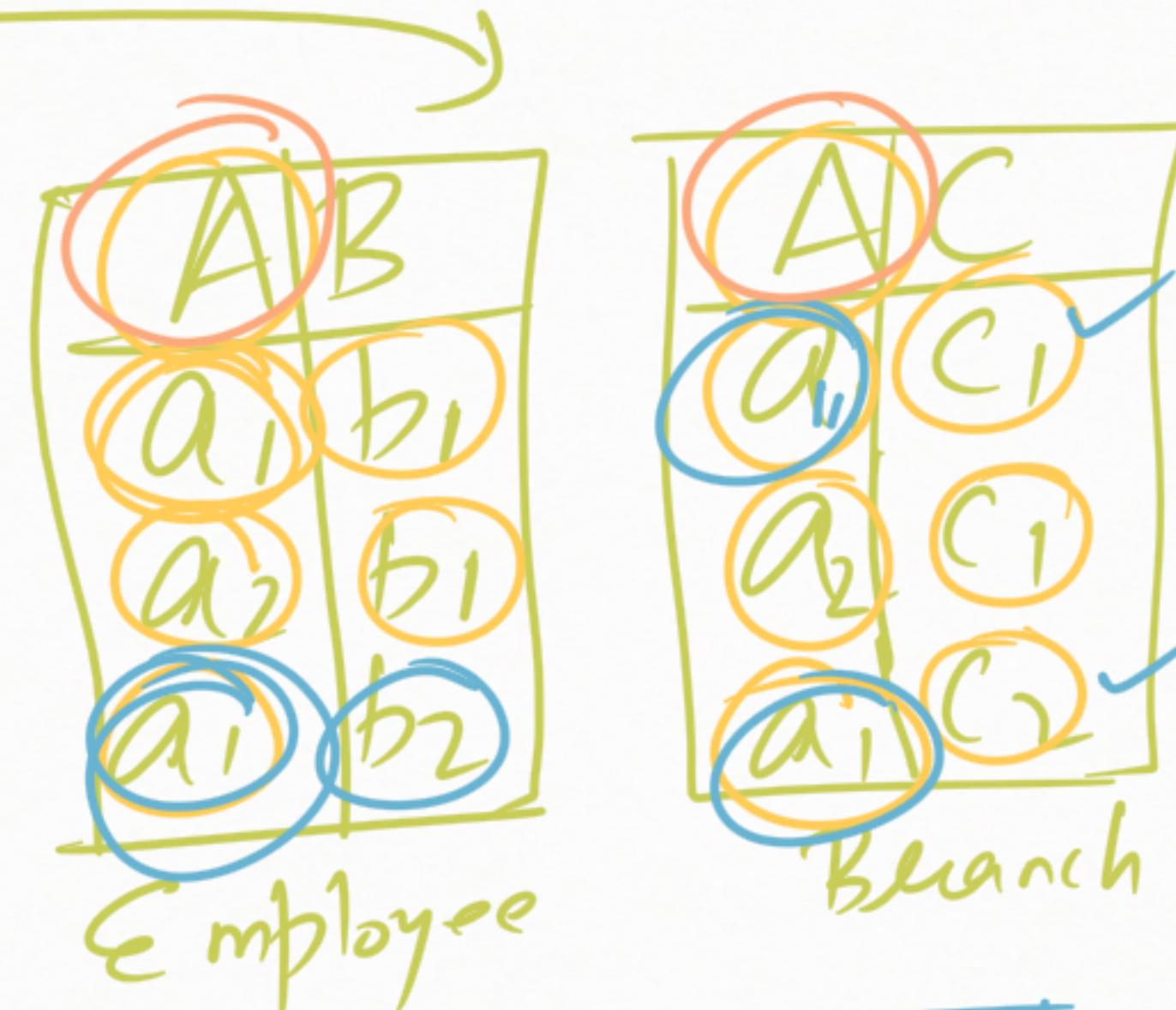
yes lost, since sent and received isn't exactly same



A	B	C
a ₁	b ₁	c ₁
a ₂	b ₁	c ₁
a ₁	b ₂	c ₂

Tabelle 1

Decomposition
Breaking
Table



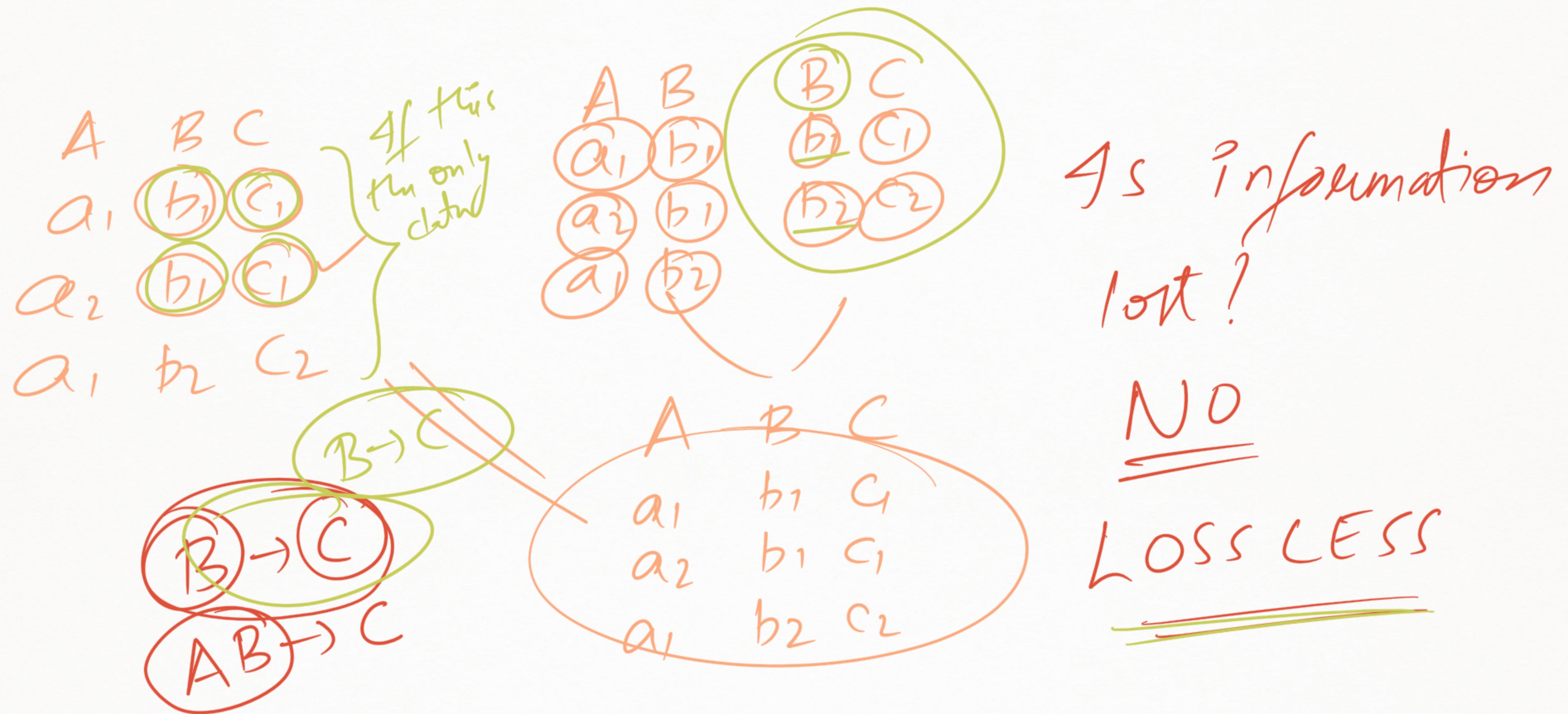
A	B	C
a ₁	b ₁	c ₁
a ₁	b ₁	c ₂
a ₂	b ₁	c ₁
a ₁	b ₂	c ₁
a ₁	b ₂	c ₂

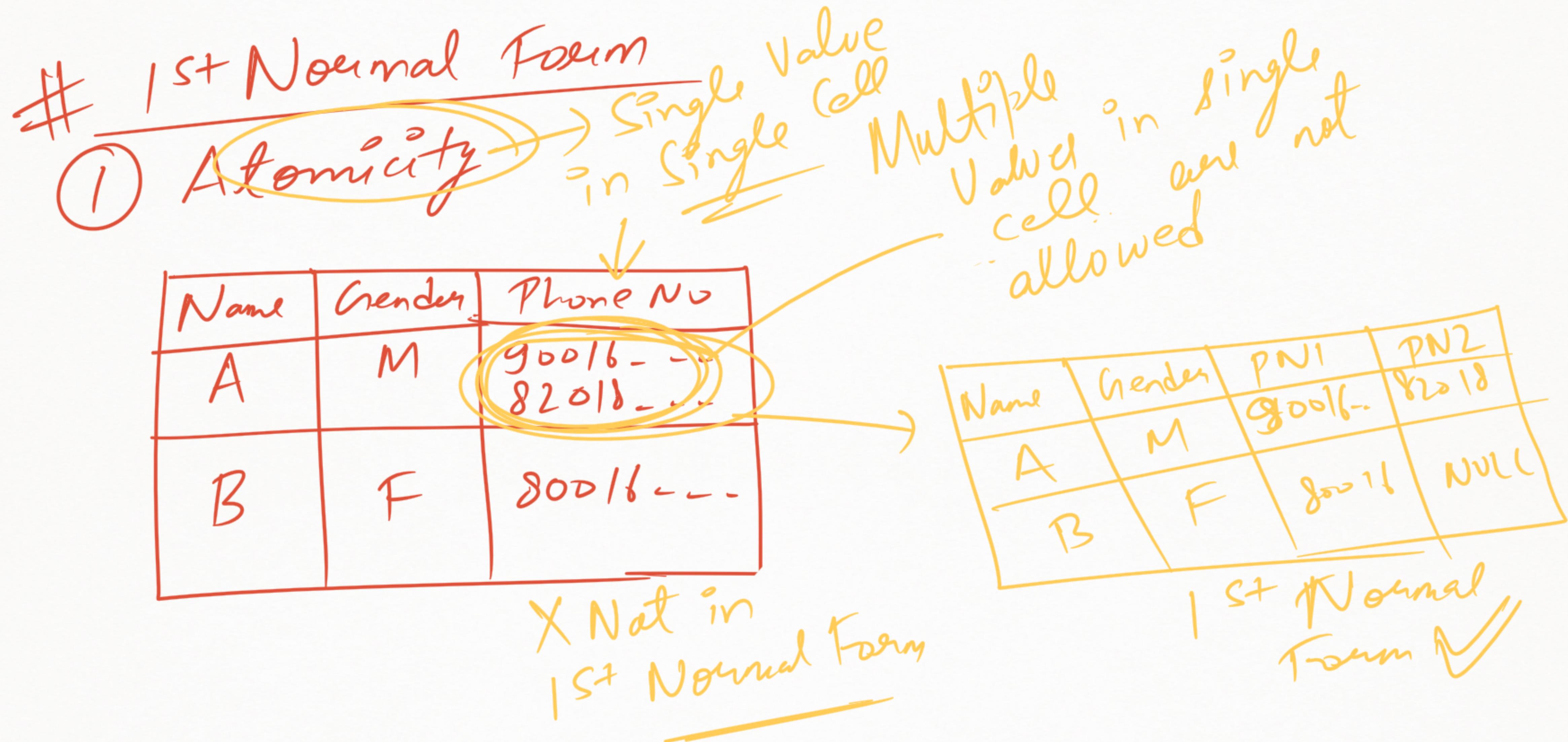
Table 2

Is information lost? Yes/No?

Yes

Lossy





2nd Normal Form \rightarrow INF ✓

	A	B	C
1	a		C_1
2	b		C_1
3	c		C_2
4	c		C_2
5	c		C_3
6	c		C_3
7	c		C_3
8	c		C_3

$$A^+ = \{A\}$$

$$B^+ = \{B, C\}$$

$$C^+ = \{C\}$$

$$AB^+ = \{A, B, C\}$$

$$BC$$

$$A, B$$

$$R.H.S$$

No Partial Dependency

Part of C_k is determining something

$$AB^+ = \{A, B, C\}$$

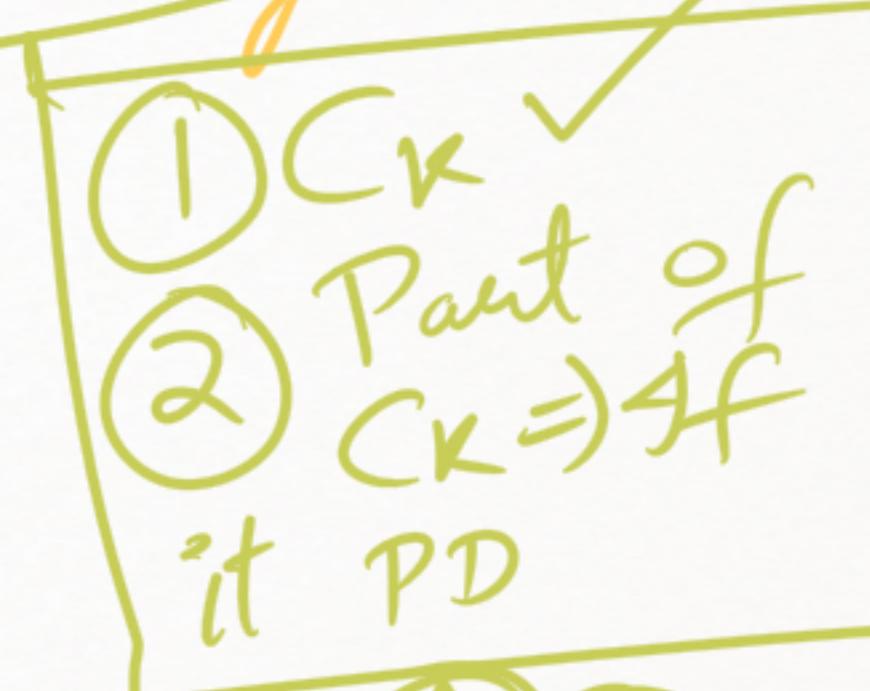
$$B^+ = \{B, C\}$$

B can determine

C X

Not in 2nd

NF



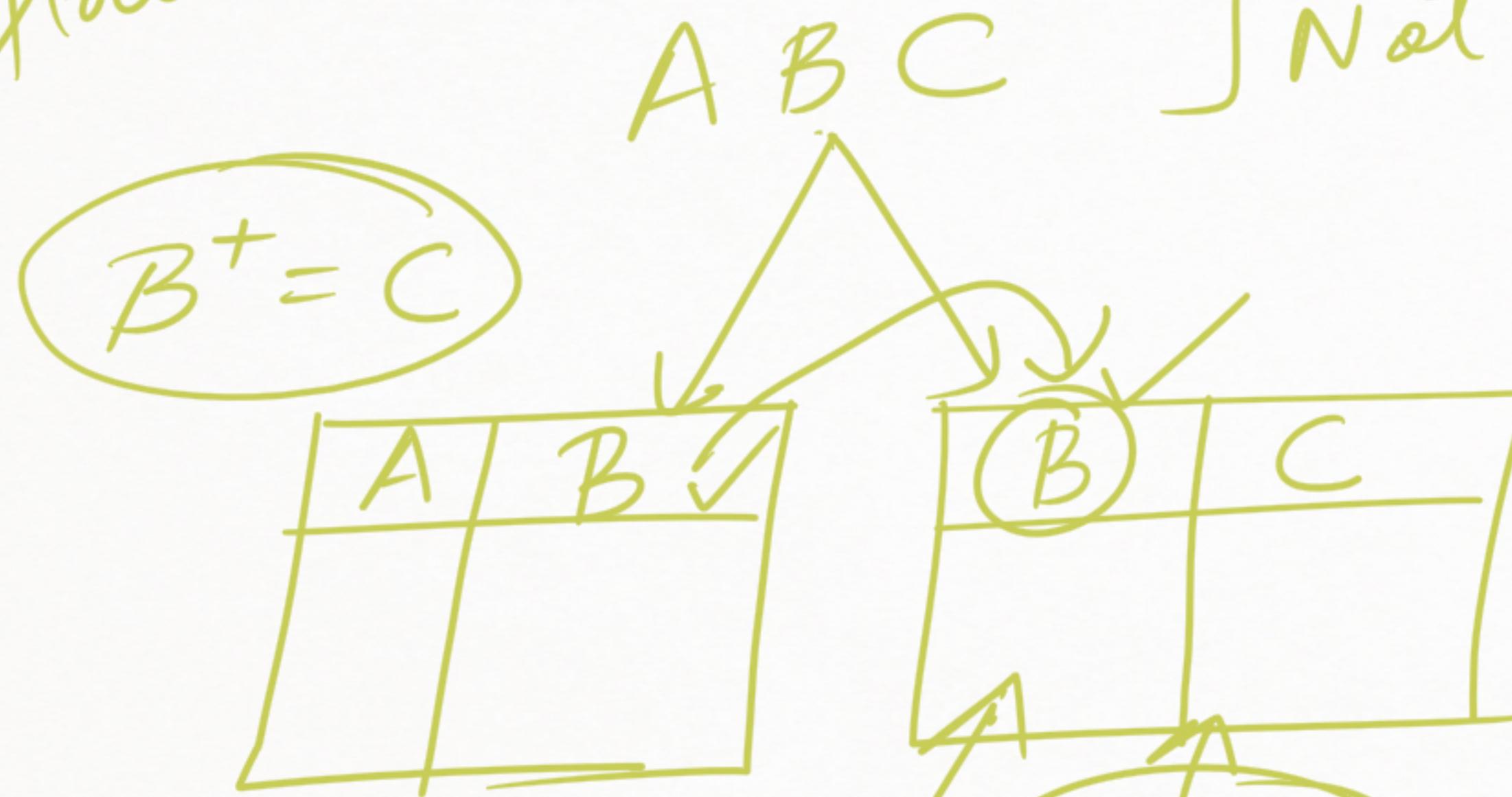
$$C_k = A^+ = \{A\}$$

How to Find a Ck?

A ~~AB~~

- Find closure of single Attributes, if any attribute can determine everything else, than it is on of the Ck
- Follow the same for others, and then also look for combination of attributes and check same things

How to make it in 2NF



When we do JOIN in SQL data will not be lost

LOSSLESS DECOMPOSITION

Unique $B \rightarrow C$

$B^+ = \{B, C\}$ ✓

$C^+ = \{C\}$

When you break down table FD may change or distribute the FD's

- ① Make a separate table for the P.D
- ② Common should be OK in one of

Foreign key is a key which is referring P.K of another table

$$\begin{array}{cccc} A & B & C & D \\ \hline \end{array}$$

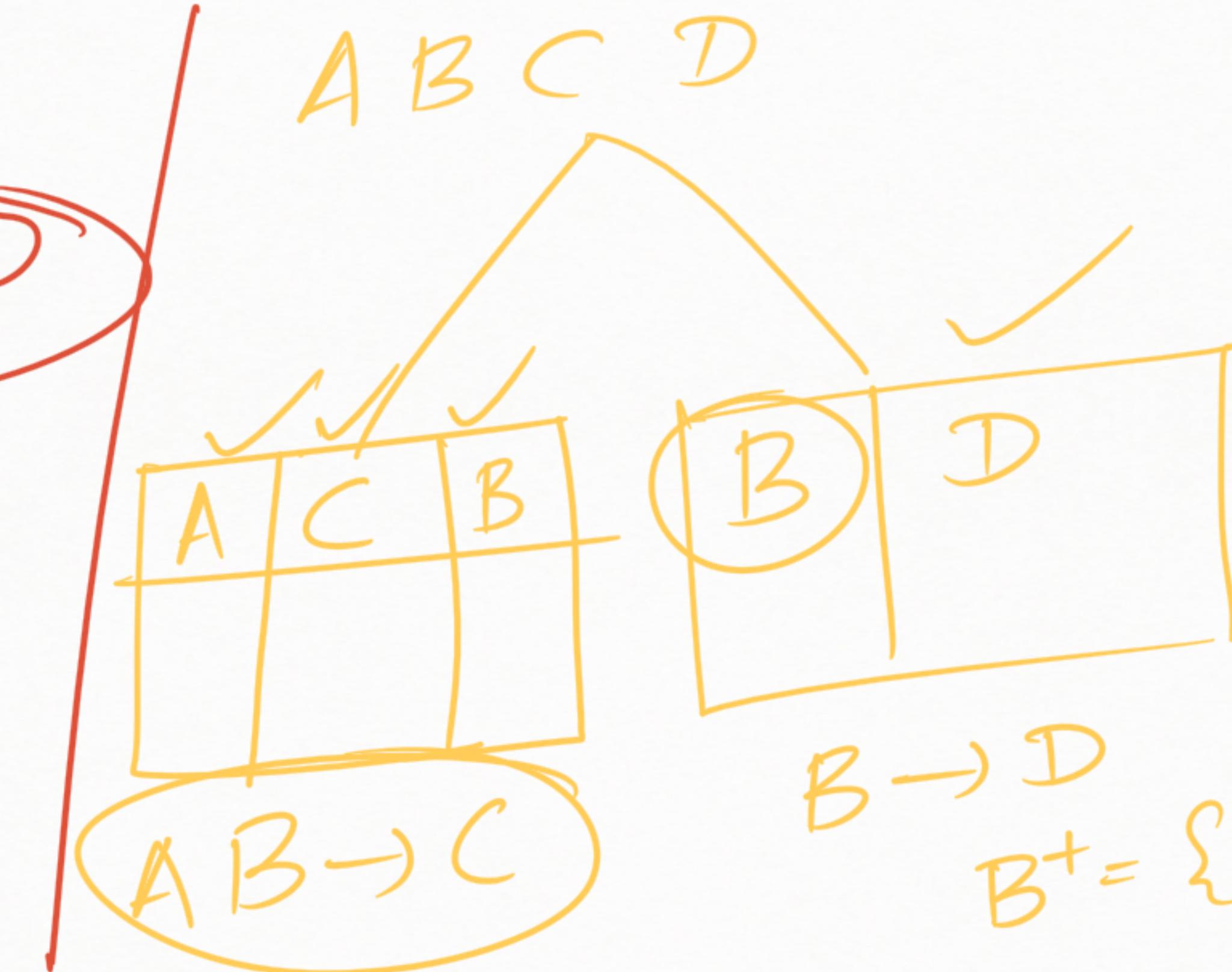
$FD = \{ AB \rightarrow C, B \rightarrow D \}$

Q1. CK = $\underline{\underline{AB}}$

Q2. P.D?

$$B^+ = \{ BD \}$$

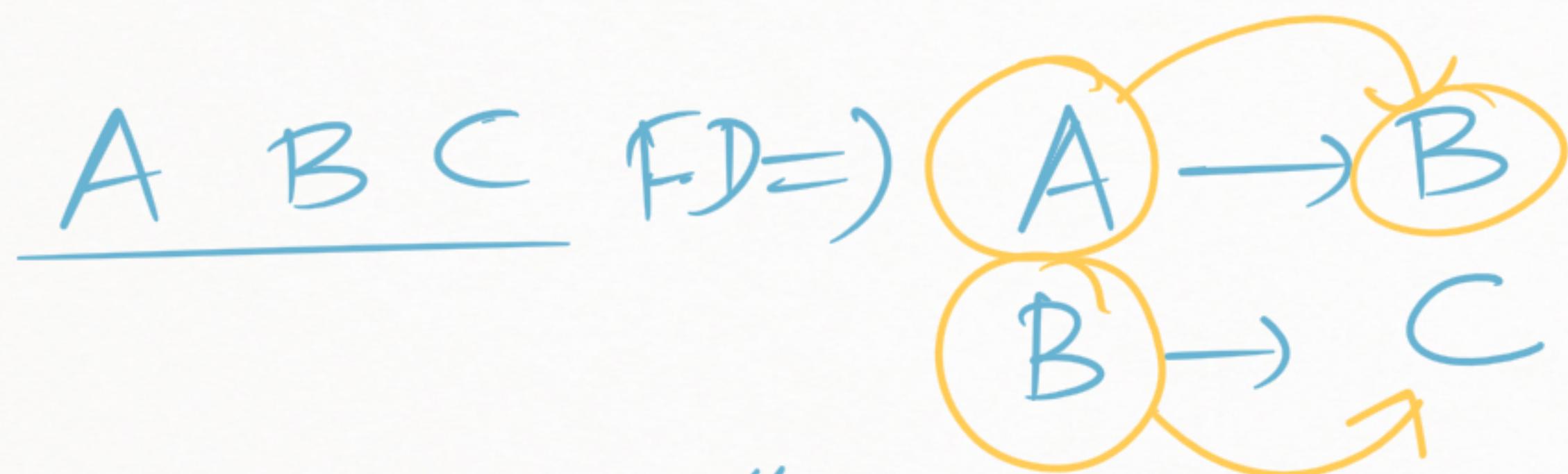
B^+
2NF? ND



$B \rightarrow D$
 $B^+ = \{ BD \}$

LOSSLESS

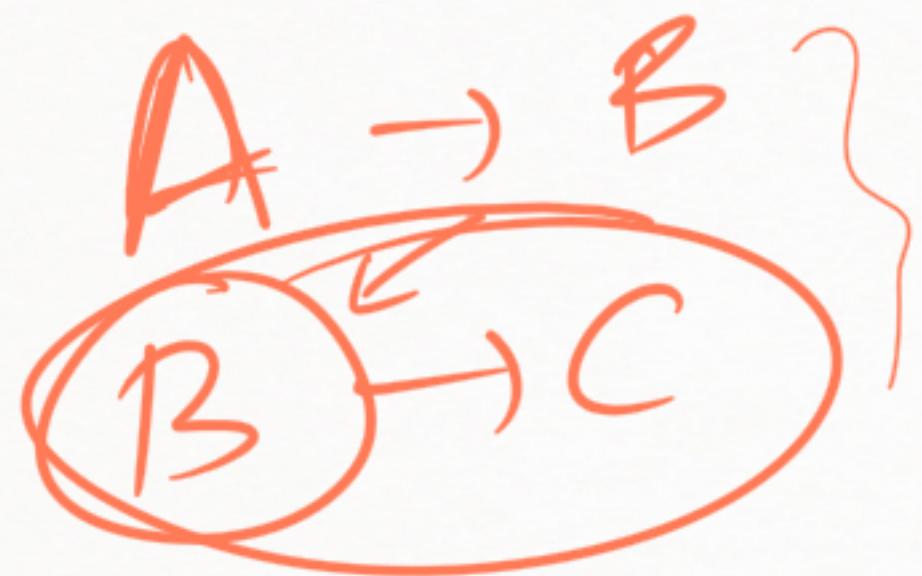
3NF \rightarrow 2NF ✓
 \rightarrow No Transitive Dependency



$C_K = A$ ✓
Transitive
Dependency.

$C_K \rightarrow$ determine y
 $y \rightarrow \cancel{x}$ anything

A B C

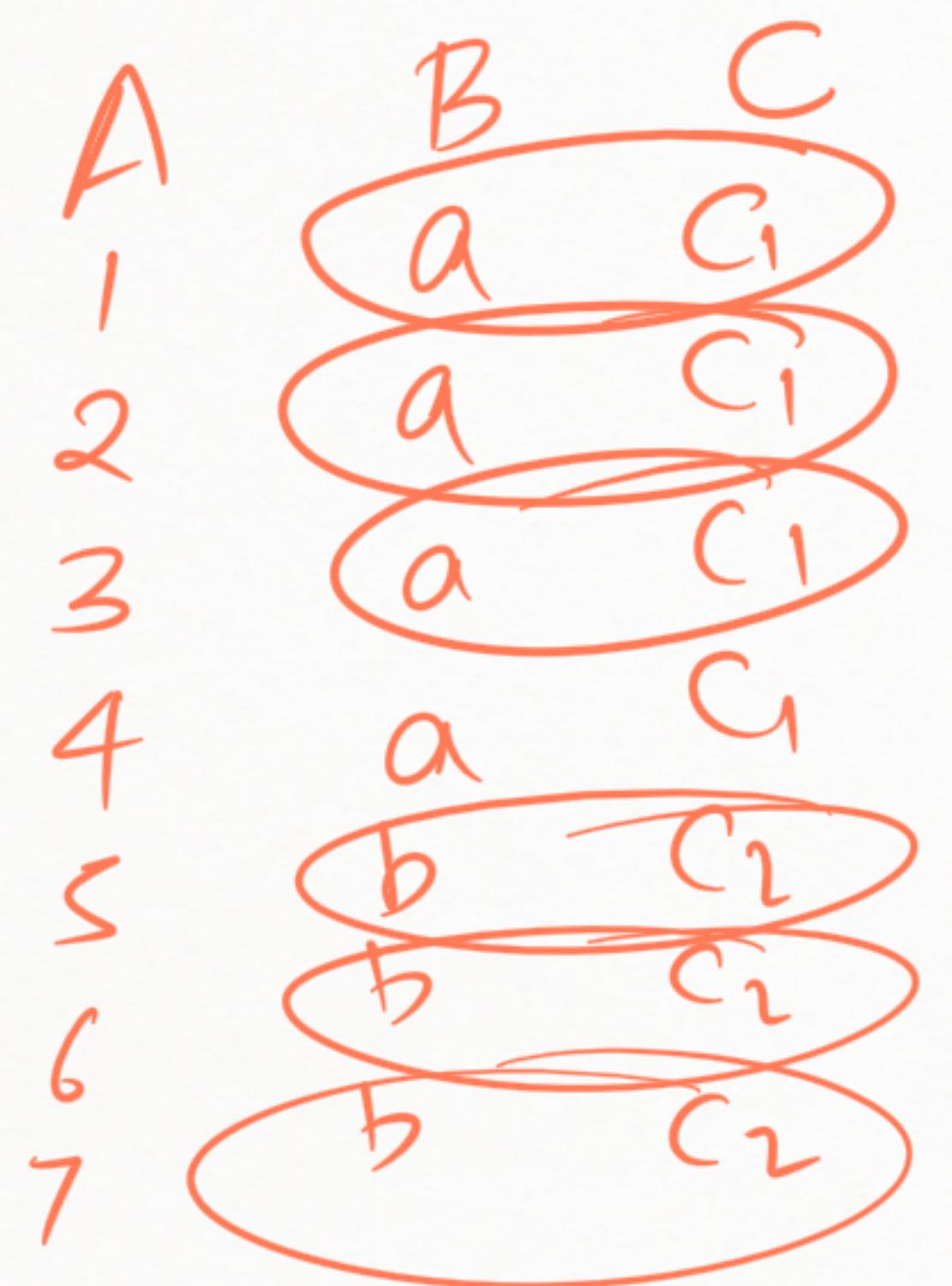


$$C_L = A$$

$$B^+ = \{ \overset{\checkmark}{B}, \overset{\checkmark}{C} \}$$

A	B

$$\begin{matrix} & B \rightarrow C \\ B^+ = \{ & \overset{\checkmark}{B}, C \} \end{matrix}$$



$A \rightarrow B$

$B \rightarrow C$

Redundancy

A	B
a	c ₁
b	c ₂

B	C
a	c ₁
b	c ₂

BCNF Boyce Codd Normal Form

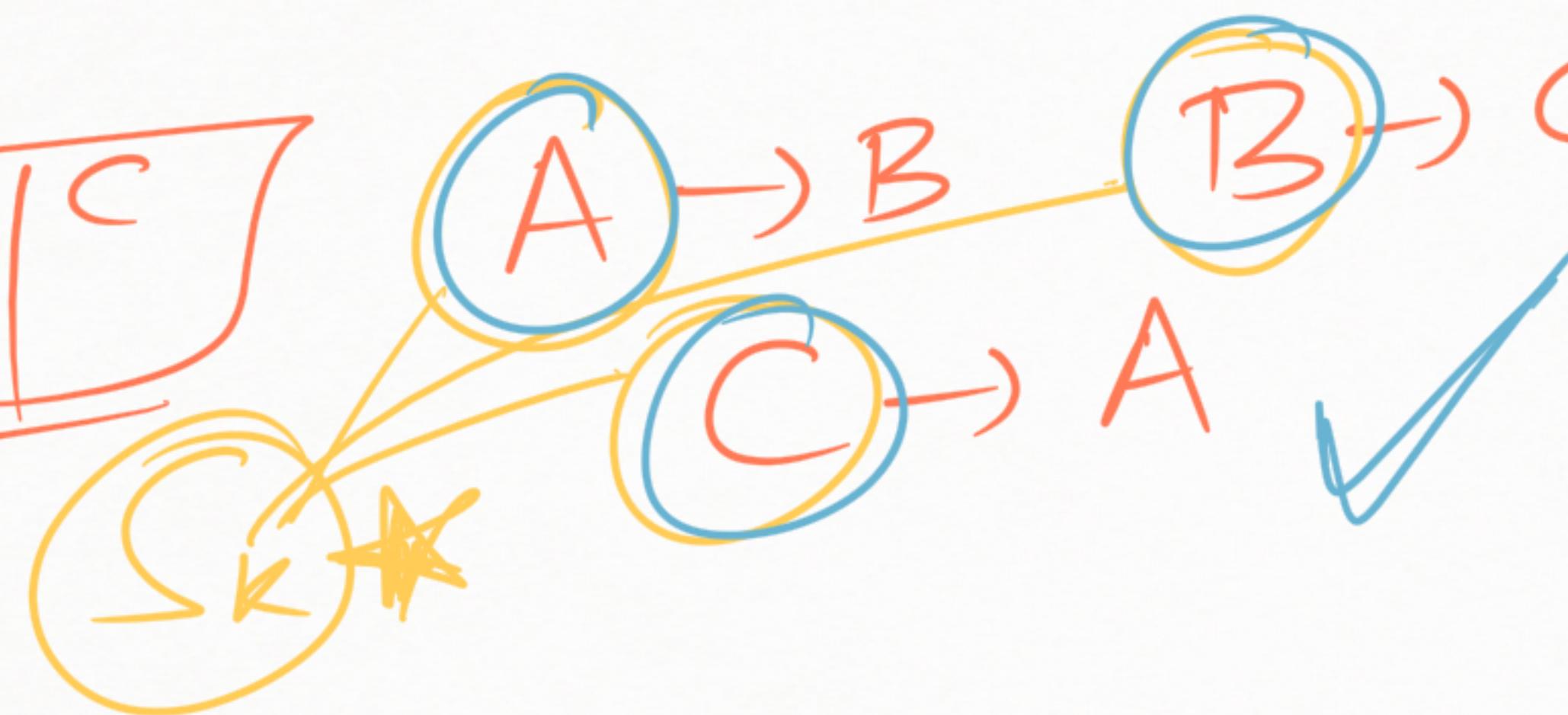
3.5 NF

Every G_k is a Super Key (S_k)

→ 3NF ✓

↙ Left Hand Side of all F.D
must be a Super Key

A	B	C
---	---	---



$$A^+ = \{A, B, C\}$$

$$B^+ = \{A, B\}$$

$$C^+ = \{A, B, C\}$$

A, B, and C are G_k

A B C

F.D = $\{AB \rightarrow C\}$

$C_K' = AB$

Which are

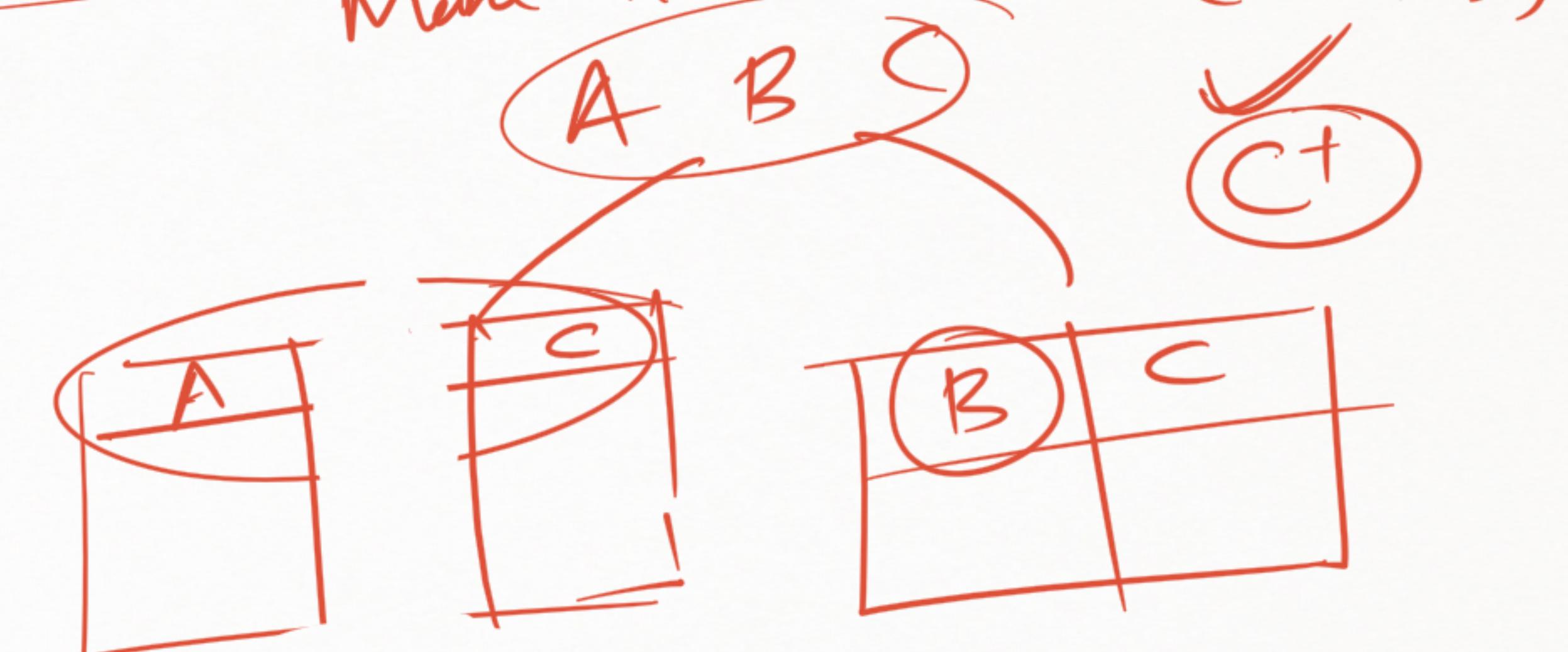
- ① AB ✓
- ② B ✗
- ③ C ✗

Super Keys :

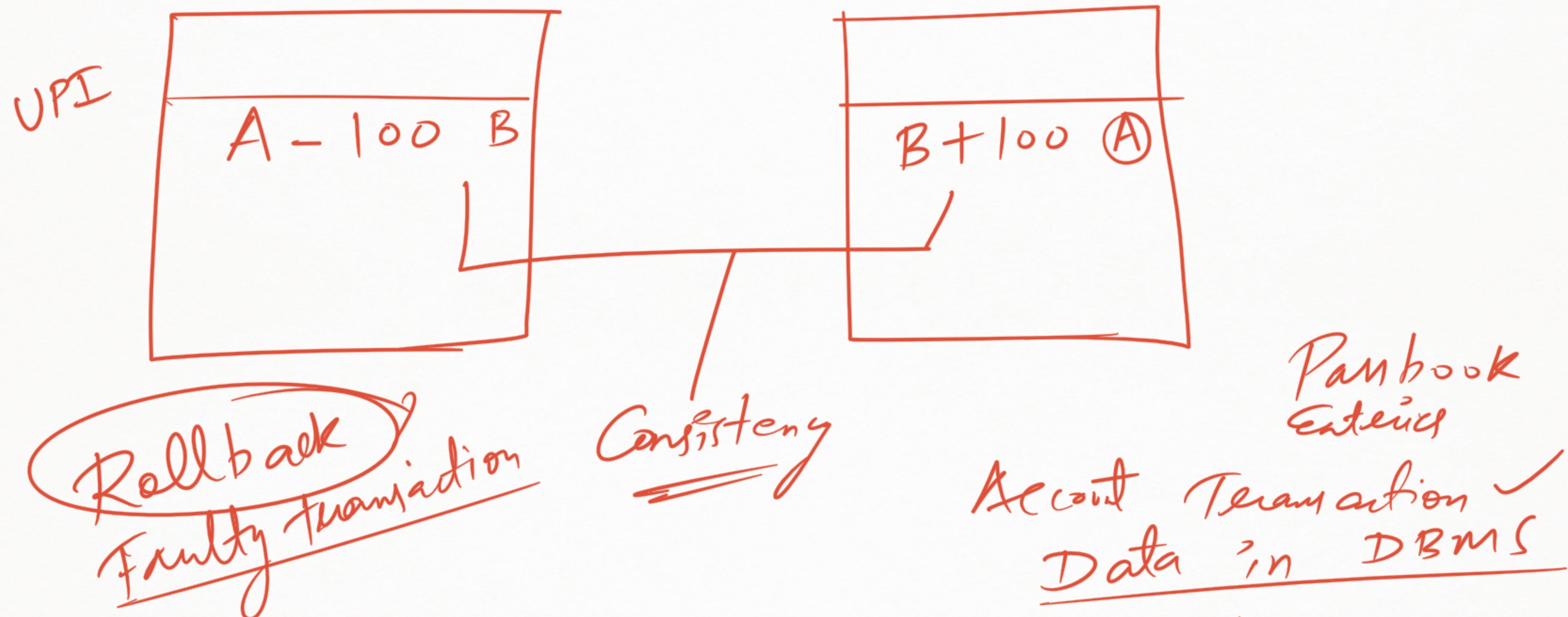
Not in BCNF / 3.SNF

Super Key = C_K + Something
Something can be 0.

Make it in BCNF



Transaction & Concurrency Control

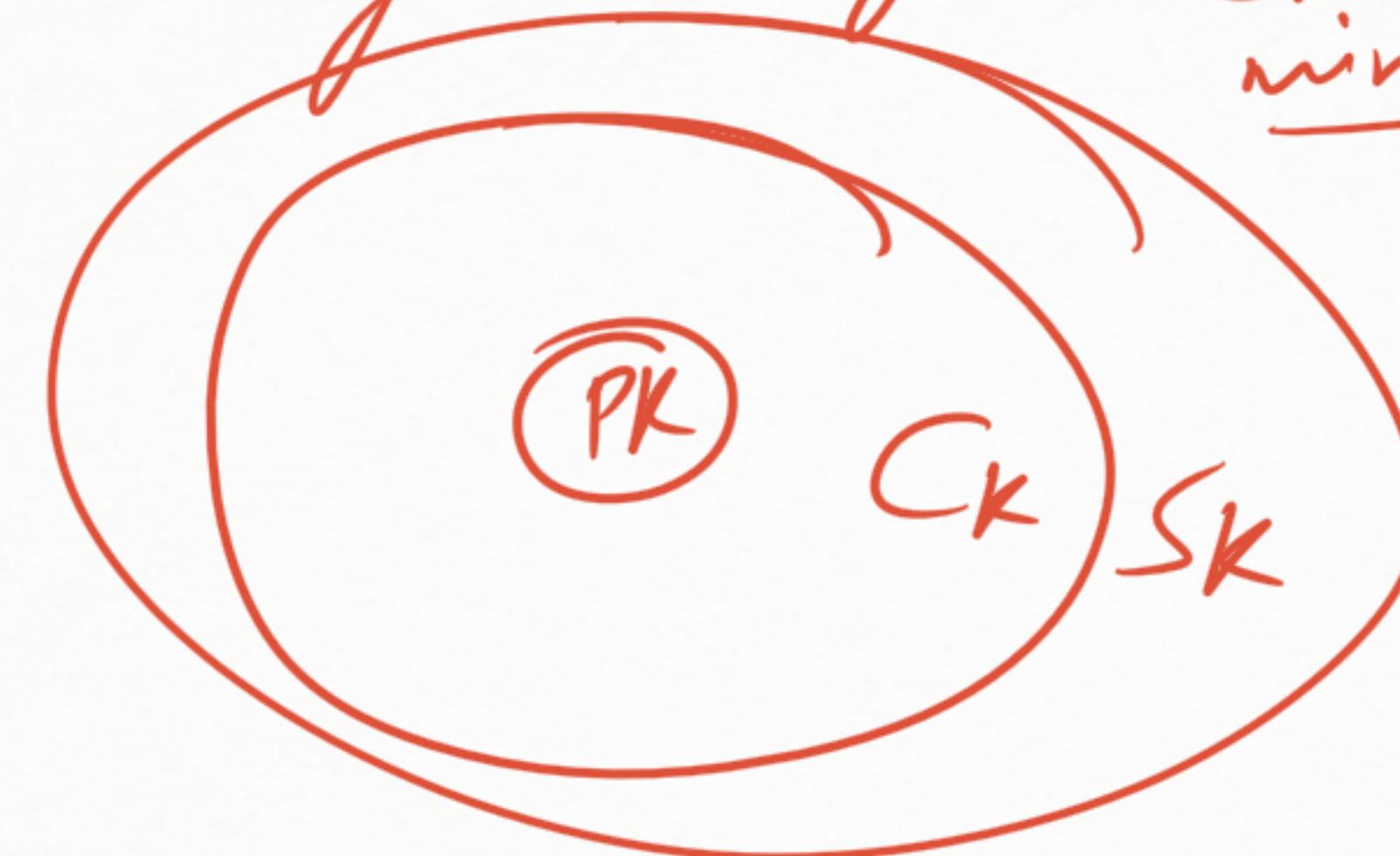


Interview

① 2nd Highest Salary in Emp Table
[Nth Highest Salary]

② Candidate Key Vs Super Key Vs

Pumary Key.
Ck is unique
minim



$$SK = CK + \text{waste}$$

PK = One of
the CK

③ Why do we Need Primary Key?

④ Diff b/w SQL & NoSQL

found
for
Query.

Tables

Standard

↑
there is
No Standard

⑤ Subqueries

Non Correlated

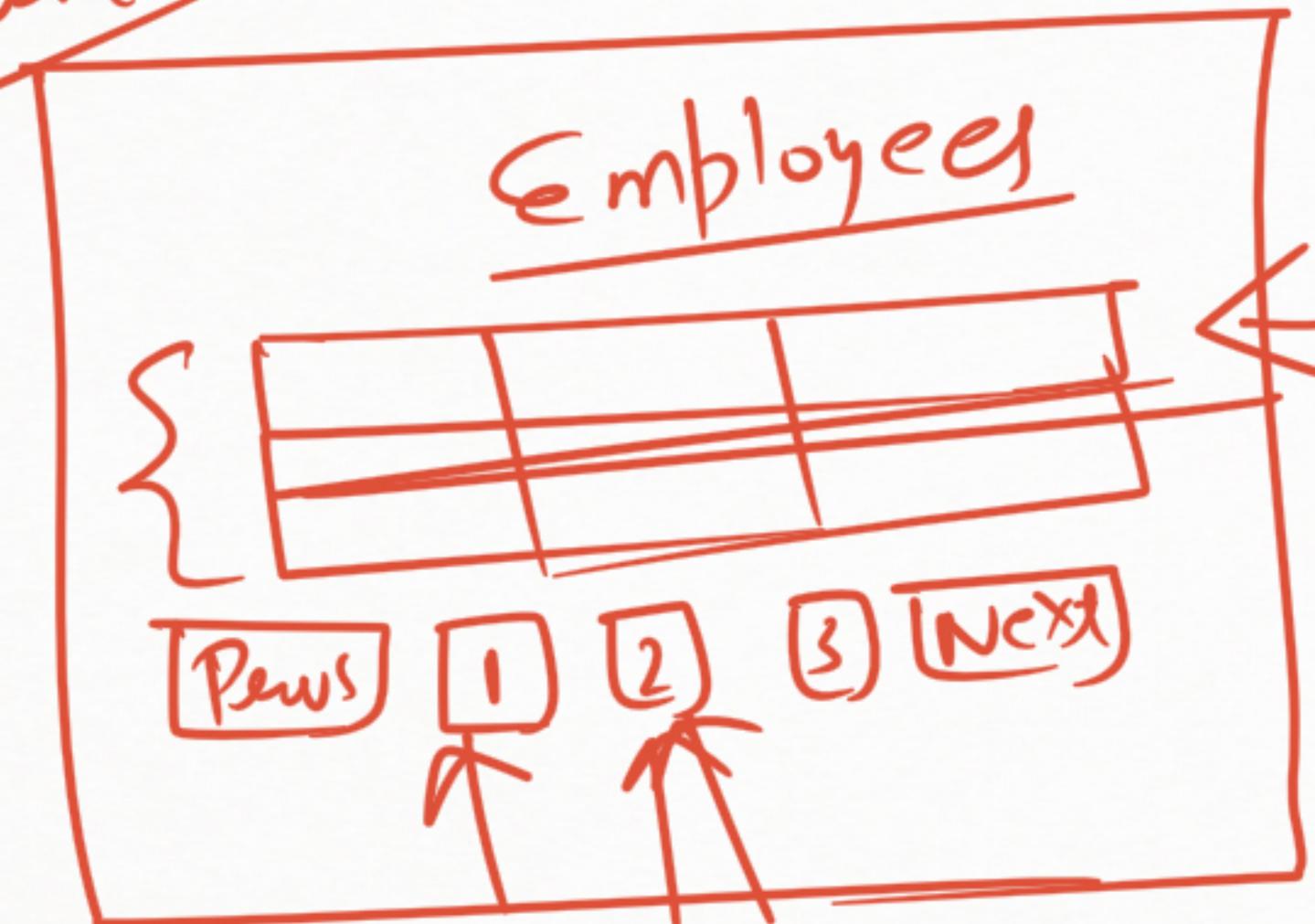
Correlated

[Subquery ≈ NESTED]

(✓)

- ⑥ Max Salary of a Department
- ⑦ LeftJoin, RightJoin, Join
- ⑧ ER Diagrams
- ⑨ Cardinality, Relationships
→ One to One
→ M: 1
→ M: N
- ⑩ Why we Need
Normalization?
- Types
- P.D
- F.D
- Triggers
- Lossless Vs
Lossy-

~~Requirement~~



Search

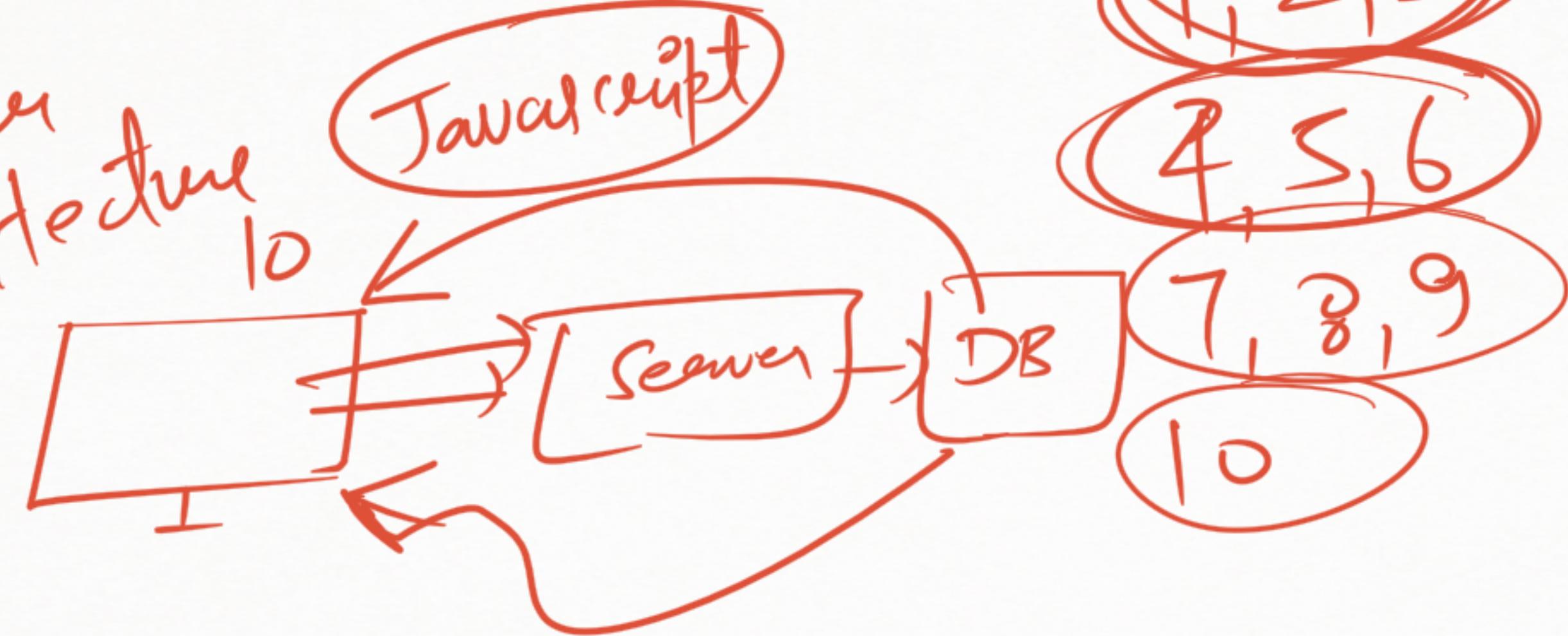
1M
like

1A⁰10

1000000

10 million

3-Tier
Architecture



JavaScript

1, 2, 3

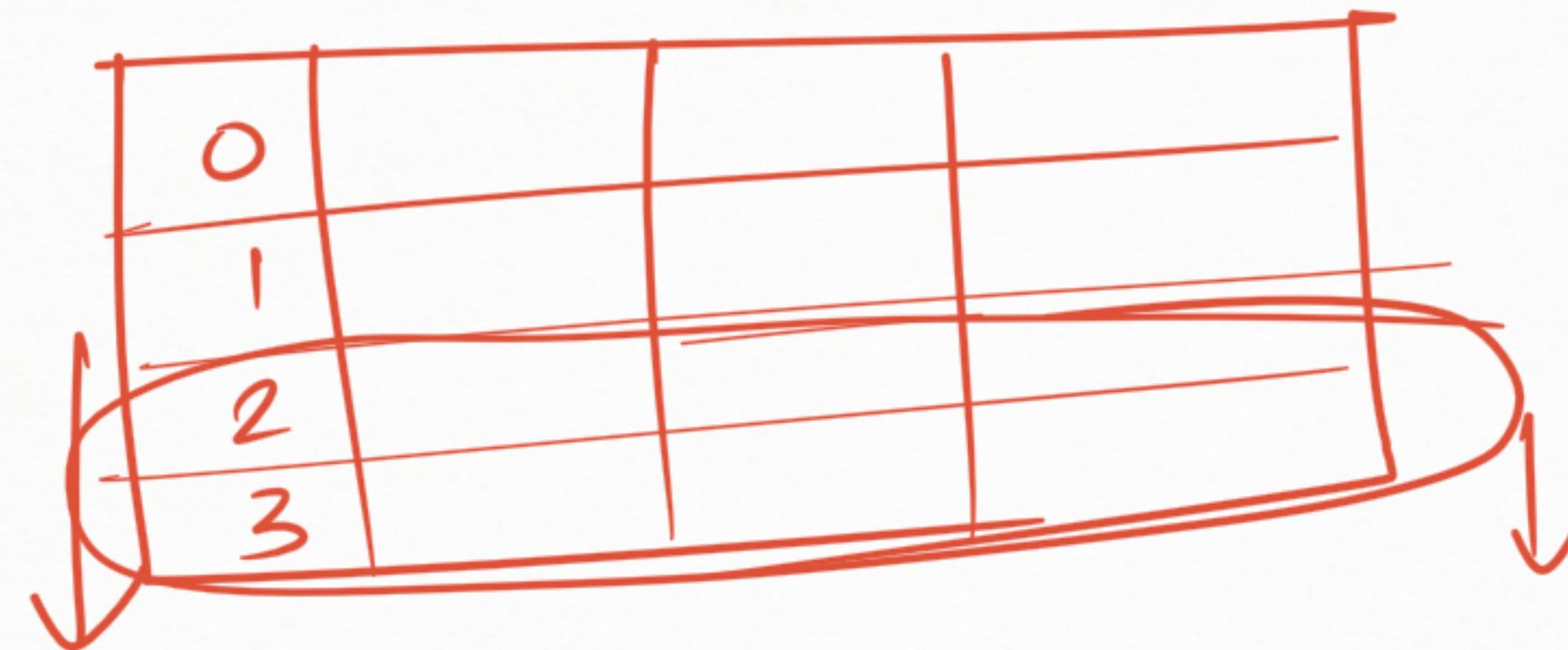
4, 5, 6

7, 8, 9

10

[]

offset



offset 2 → Millions

limit along with offset

```
mysql> select * from employees where firstname like '%ar%' or lastname like '%ar%';
```

employeeNumber	lastName	firstName	extension	email	officeCode	reportsTo	jobTitle
1056	Patterson	Mary	x4611	mpatterso@classicmodelcars.com	1	1002	VP Sales
1102	Bondur	Gerard	x5408	gbondur@classicmodelcars.com	4	1056	Sale Manager (EMEA)
1370	Hernandez	Gerard	x2028	ghernande@classicmodelcars.com	4	1102	Sales Rep
1501	Bott	Larry	x2311	lbott@classicmodelcars.com	7	1102	Sales Rep
1504	Jones	Harry	x102	bjones@classicmodelcars.com	7	1102	Sales Rep
1612	Marsh	Peter	x102	pmarsh@classicmodelcars.com	6	1088	Sales Rep
1702	Gerard	Martin	x2312	mgerard@classicmodelcars.com	4	1102	Sales Rep

7 rows in set (0.00 sec)

~~7 rows~~
Search

all

```

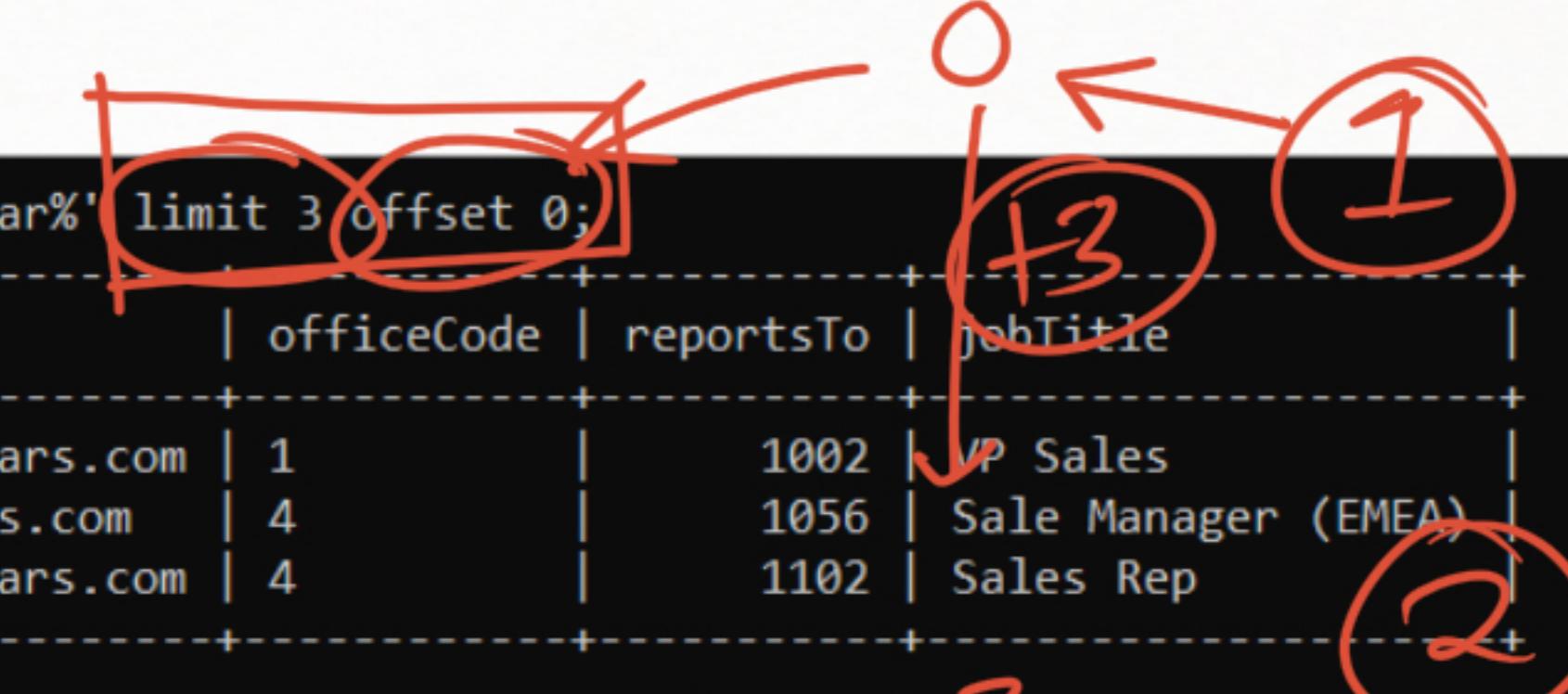
mysql> select * from employees where firstname like '%ar%' or lastname like '%ar%' limit 3 offset 0;
+-----+-----+-----+-----+-----+-----+-----+-----+
| employeeNumber | lastName | firstName | extension | email | officeCode | reportsTo | jobTitle |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 1056 | Patterson | Mary | x4611 | mpatterso@classicmodelcars.com | 1 | 1002 | VP Sales |
| 1102 | Bondur | Gerard | x5408 | gbondur@classicmodelcars.com | 4 | 1056 | Sale Manager (EMEA) |
| 1370 | Hernandez | Gerard | x2028 | ghernande@classicmodelcars.com | 4 | 1102 | Sales Rep |
+-----+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)

mysql> select * from employees where firstname like '%ar%' or lastname like '%ar%' limit 3 offset 3;
+-----+-----+-----+-----+-----+-----+-----+-----+
| employeeNumber | lastName | firstName | extension | email | officeCode | reportsTo | jobTitle |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 1501 | Bott | Larry | x2311 | lbott@classicmodelcars.com | 7 | 1102 | Sales Rep |
| 1504 | Jones | Barry | x102 | bjones@classicmodelcars.com | 7 | 1102 | Sales Rep |
| 1612 | Marsh | Peter | x102 | pmarsh@classicmodelcars.com | 6 | 1088 | Sales Rep |
+-----+-----+-----+-----+-----+-----+-----+-----+
3 rows in set (0.00 sec)

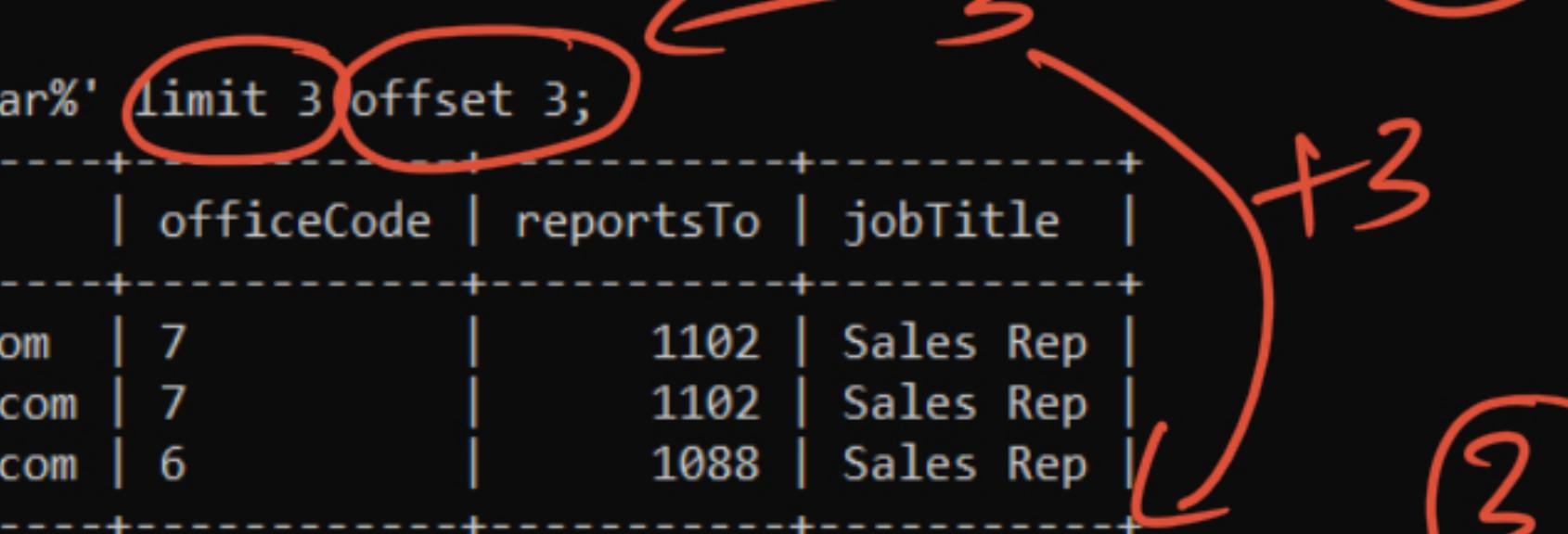
mysql> select * from employees where firstname like '%ar%' or lastname like '%ar%' limit 3 offset 6;
+-----+-----+-----+-----+-----+-----+-----+-----+
| employeeNumber | lastName | firstName | extension | email | officeCode | reportsTo | jobTitle |
+-----+-----+-----+-----+-----+-----+-----+-----+
| 1702 | Gerard | Martin | x2312 | mgerard@classicmodelcars.com | 4 | 1102 | Sales Rep |
+-----+-----+-----+-----+-----+-----+-----+-----+
1 row in set (0.00 sec)

```

First
3



Next
3



Next
3

