

# Normalization



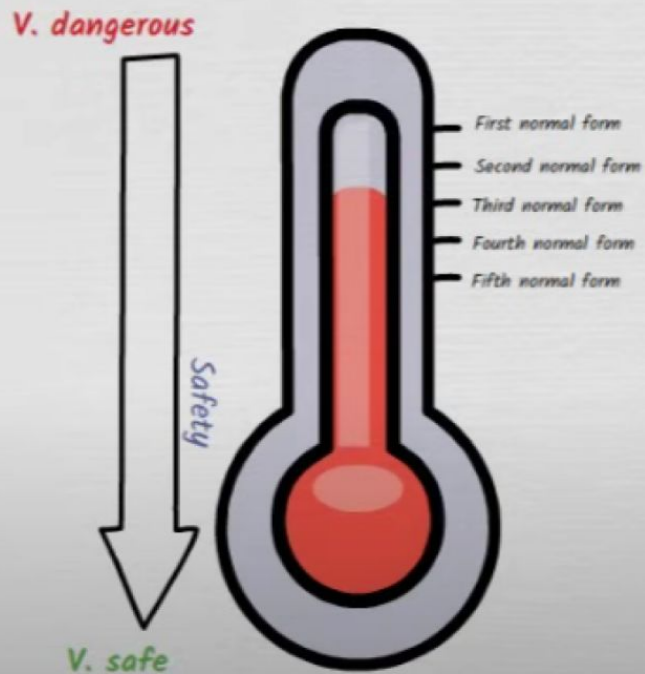
Ragav kumar V



@ragavkumarv



# The normal forms



## **First Normal Form Rules:**

- 1) *Using row order to convey information is not permitted*
- 2) *Mixing data types within the same column is not permitted*
- 3) *Having a table without a primary key is not permitted*
- 4) *Repeating groups are not permitted*

Members of the Beatles  
from Tallest  
to Shortest

Paul

John

George

Ringo



Members of the Beatles

from Tallest  
to Shortest

Paul
John
George
✓ Ringo

Not normalized

Using row order to convey  
information violates 1NF.

*Beatle\_Height*

<i>Beatle</i>	<i>Height_In_Cm</i>
<i>George</i>	<i>178</i>
<i>John</i>	<i>179</i>
<i>Ringo</i>	<i>170</i>
<i>Paul</i>	<i>180</i>

## Beatle\_Height

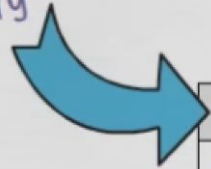
Beatle	Height_In_Cm (integer)
George	178
John	179
Ringo	Somewhere between 168 and 171
Paul	180

Mixing data types within the same column violates 1NF

(and the DB platform won't let you do it anyway)



We should make this  
the primary key...



Beatle\_Height

Beatle	Height_In_Cm
George	178
John	179
Ringo	170
Paul	180

```
ALTER TABLE Beatle_Height  
ADD PRIMARY KEY (Beatle);
```

Making "Beatle" the primary key prevents this:

Beatle	Height_In_Cm
George	178
John	179
John	186
Ringo	170
Paul	180

A table without a primary key  
violates 1NF.



Player_ID	Inventory
jdog21	2 amulets, 4 rings
gilal9	18 copper coins
trev73	3 shields, 5 arrows, 30 copper coins, 7 rings

- Repeating group

terrible design)

Player_ID	Inventory
jdog21	2 amulets, 4 rings
gilal9	18 copper coins
trev73	3 shields, 5 arrows, 30 copper coins, 7 rings

## Player\_Inventory

Player_ID	Quantity_1	Item_Type_1	Quantity_2	Item_Type_2	Quantity_3	Item_Type_3	Quantity_4	Item_Type_4
jdog21	2	amulets	4	rings				
gilal9	18	copper coins						
trev73	3	shields	5	arrows	30	copper coins	7	rings

*(This is no good either...)*

*Storing a repeating group of data items on a single row violates First Normal Form.*

## Player\_Inventory



Player_ID	Item_Type	Item_Quantity
jdogg21	amulets	2
jdogg21	rings	4
gilal9	copper coins	18
trev73	shields	3
trev73	arrows	5
trev73	copper coins	30
trev73	rings	7

- "Player trev73 has 3 shields"

- "Player trev73 has 5 arrows"



## **First Normal Form Rules:**

- 1) Using row order to convey information is not permitted
- 2) Mixing data types within the same column is not permitted
- 3) Having a table without a primary key is not permitted
- 4) Repeating groups are not permitted



## Player\_Inventory

Player_ID	Item_Type	Item_Quantity	Player_Rating
jdog21	amulets	2	Intermediate
jdog21	rings	4	Intermediate
gilal9	copper coins	18	Beginner
trev73	shields	3	Advanced
trev73	arrows	5	Advanced
trev73	copper coins	30	Advanced
trev73	rings	7	Advanced

## Player\_Inventory


Player_ID	Item_Type	Item_Quantity	Player_Rating
jdog21	amulets	2	Intermediate
jdog21	rings	4	Intermediate
trev73	shields	3	Advanced
trev73	arrows	5	Advanced
trev73	copper coins	30	Advanced
trev73	rings	7	Advanced



Primary key:  
 { Player\_ID, Item\_Type }

## Player\_Inventory

Non-key attributes:  
 Item\_Quantity, Player\_Rating

 Player_ID	Item_Type	Item_Quantity	Player_Rating
jdog21	amulets	2	Intermediate
jdog21	rings	4	Intermediate
gilal9	copper coins	18	Beginner
trev73	shields	3	Advanced
trev73	arrows	5	Advanced
trev73	copper coins	30	Advanced
trev73	rings	7	Advanced

Second Normal Form: Each non-key attribute must depend on the entire primary key.

{ Player\_ID, Item\_Type }  $\rightarrow$  { Item\_Quantity } ✓

Player

 Player_ID	Player_Rating
jdog21	Intermediate
gilal9	Beginner
trev73	Advanced
tina42	Beginner


 $\{ \text{Player\_ID} \} \rightarrow \{ \text{Player\_Rating} \}$ 

Player\_Inventory

 Player_ID	Item_Type	Item_Quantity
jdog21	amulets	2
jdog21	rings	4
gilal9	copper coins	18
trev73	shields	3
trev73	arrows	5
trev73	copper coins	30
trev73	rings	7

 $\{ \text{Player\_ID}, \text{Item\_Type} \} \rightarrow \{ \text{Item\_Quantity} \}$


## Player

 Player_ID	Player_Rating	Player_Skill_Level
jdog21	Intermediate	4
gilal9	Beginner	3
trev73	Advanced	8
tina42	Beginner	1

## SKILL LEVEL

1	2	3	4	5	6	7	8	9
Rating: Beginner			Rating: Intermediate			Rating: Advanced		

## Player

 Player_ID	Player_Rating	Player_Skill_Level
jdog21	Intermediate	4
gila19	Beginner	4
trev73	Advanced	8
tina42	Beginner	1


*Inconsistency!*

## SKILL LEVEL

1	2	3	4	5	6	7	8	9
Rating: Beginner			Rating: Intermediate			Rating: Advanced		



# Player

 Player_ID	Player_Rating	Player_Skill_Level
jdog21	Intermediate	4
gilal9	Beginner	4
trev73	Advanced	8
tina42	Beginner	1

Inconsistency!

## SKILL LEVEL



$\{ \text{Player\_ID} \} \rightarrow \{ \text{Player\_Skill\_Level} \}$

$\{ \text{Player\_ID} \} \rightarrow \{ \text{Player\_Skill\_Level} \} \rightarrow \{ \text{Player Rating} \}$



Player

Player_ID	Player_Skill_Level
jdog21	4
gilal9	4
trev73	8
tina42	1

Player\_Skill\_Levels

 Player_Skill_Level	Player_Rating
1	Beginner
2	Beginner
3	Beginner
4	Intermediate
5	Intermediate
6	Intermediate
7	Advanced
8	Advanced
9	Advanced

Third Normal Form: Every non-key attribute in a table should depend on the key, the whole key, and nothing but the key.

Every ~~non-key~~ attribute in a table should depend on the key, the whole key,

That's all folks 😊