Lossless/Lossy Join Decomposition

- Whenever we **Normalize** a table that means we **Decmpose** the table i.e., we **break down** the table into multiple tables.
- For **Normalizing** or **Decomposing** a table, the following rules should be followed:
  1. The **Decomposition** should be done with the tables having **atleast one common attribute** among them.
  2. So that we can **join the decomposed tables to retreive the data again**.

1. Lossy Decomposition

- If the number of tuples of the table that is created by joining the **decomposed tables** tables is **not the same** as the number of tuples of teh **original table**, then it is called a **Lossy Decomposition** of the original table.
- Example: Let, the following R_1 table is decomposed into **two** tables R_2 & R_3 with B being the **common attribute** among them.

A	B	C
1	2	1
2	2	2
3	3	2

$Table : R_1$

A	B
1	2
2	2
3	3

$Table : R_2$

B	C
2	1
2	2
3	2

$Table : R_3$

Now, if the **decomposed tables** R_2 & R_3 are joined using **Natural Join**, then we'll find an **inconsistency** in the number of tuples from the **original table**.
After joining R_2 & R_3, we get the following $R^{'}$ table with 5 tuples in it.

A	B	C
1	2	1
1	2	2
2	2	1
2	2	2
3	2	2

$Table : R^{'}$

- **Overcoming Lossy Decomposition**:
  - The common attribute should be a **CK** or a **SK** of either of R_1 or R_2 or both.
  - This will make a table from joining the decomposed table with the equal number of tuples as the original table. And that's known as **Lossless Decomposition**.