Prepared by Mohammad Umer

Power BI Tutorial

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1. Core Principles of Power BI Development

There are two most important things we should keep in mind:

- When creating reports that provide accurate insights and meaningful information.
- When focusing on performance tuning and optimization.

The two important things are:

1. Data Preparation

This is where the **Power Query Editor** comes into the picture. Here, we can:

- Clean the data.
- Prepare and transform the data.
- Merge queries.
- Append queries.
- Remove null values.
- Replace values.
- Change data types.

By performing these operations, we obtain clean and well-structured data that can be effectively used for reporting purposes.

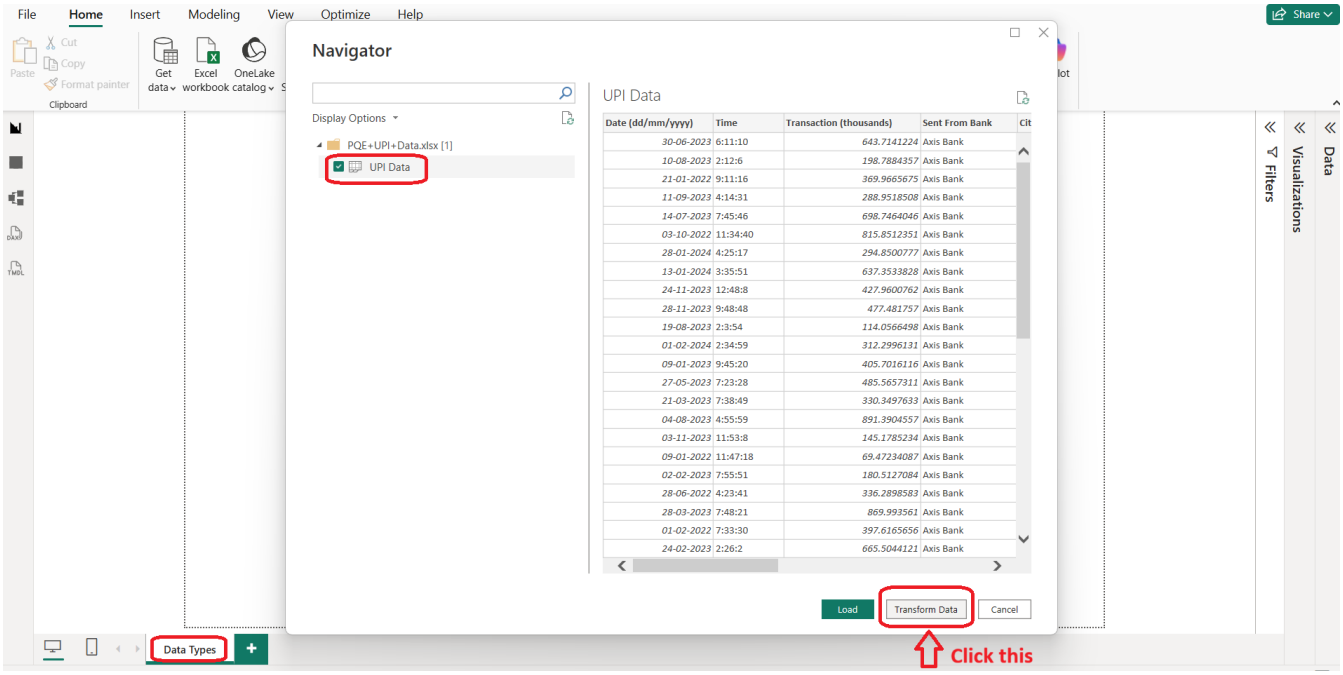
2. Data Modeling

After preparing the data, the next step is **Data Modeling**, where we organize the data in a meaningful way for analysis. In this stage, we:

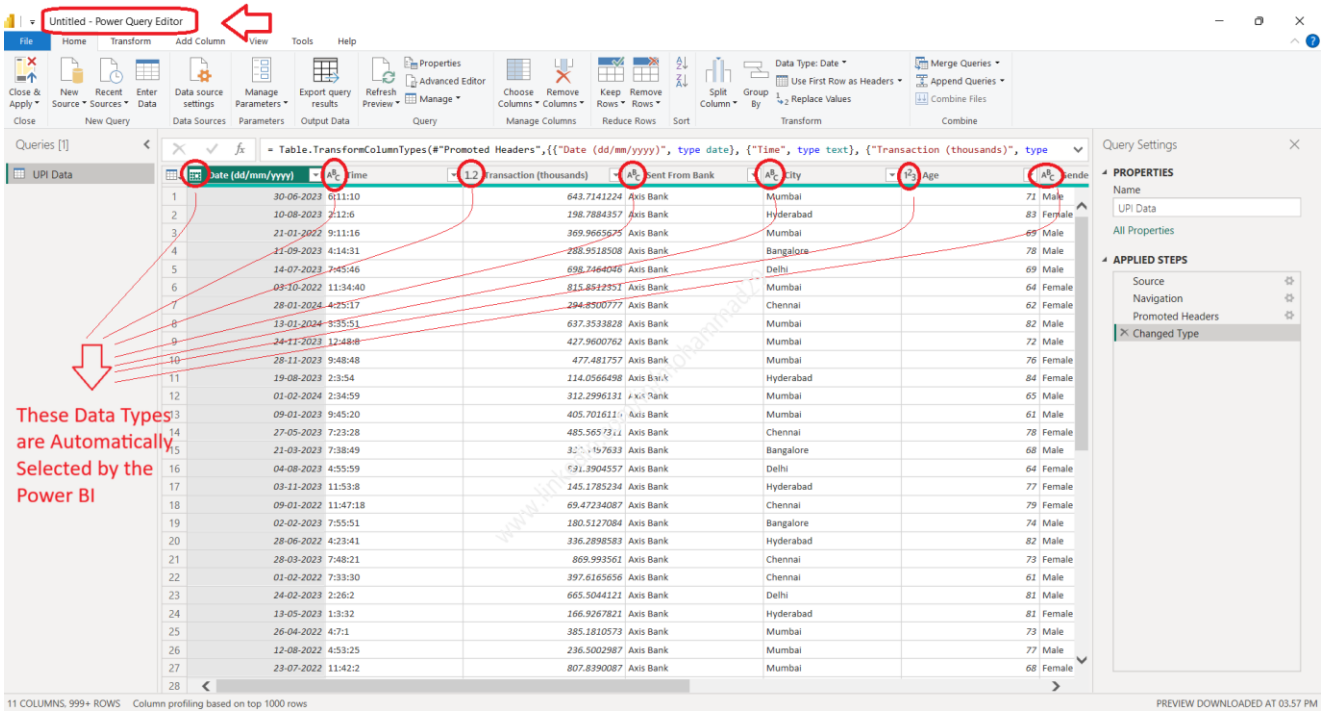
- Create relationships between different tables.
- Define primary and foreign keys.
- Apply normalization or star schema design.
- Create calculated columns and measures using DAX.
- Optimize the model for better performance and faster query execution.

A well-designed data model helps Power BI generate accurate visuals, improve performance, and make reports easier to maintain and understand.

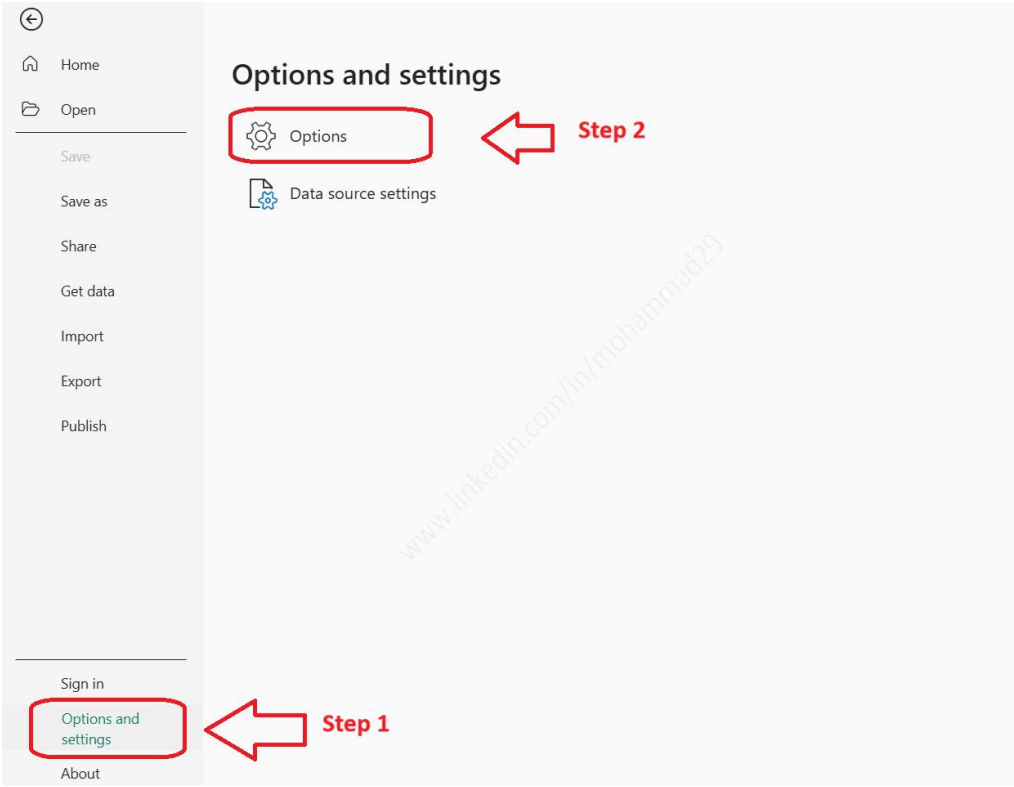
2. Power Query Editor

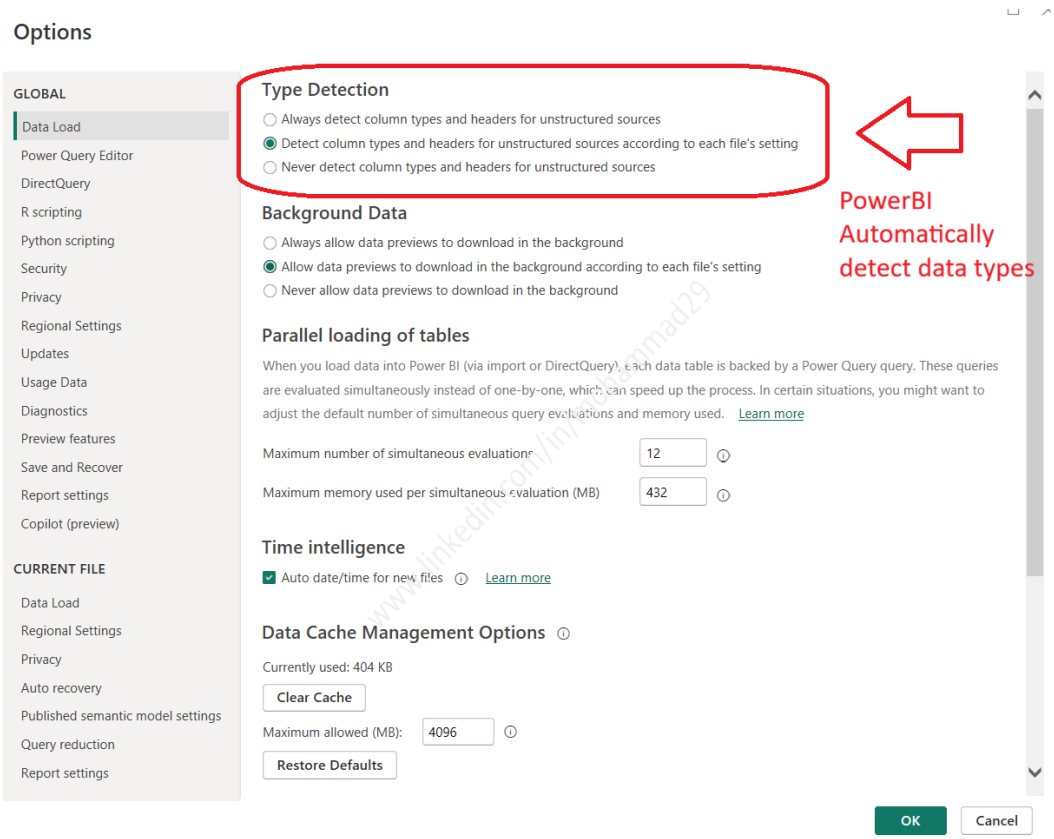


After clicking on the **'Transform Data'** → It will bring us to **'Power Query Editor'**.



Here in the setting we can find this:



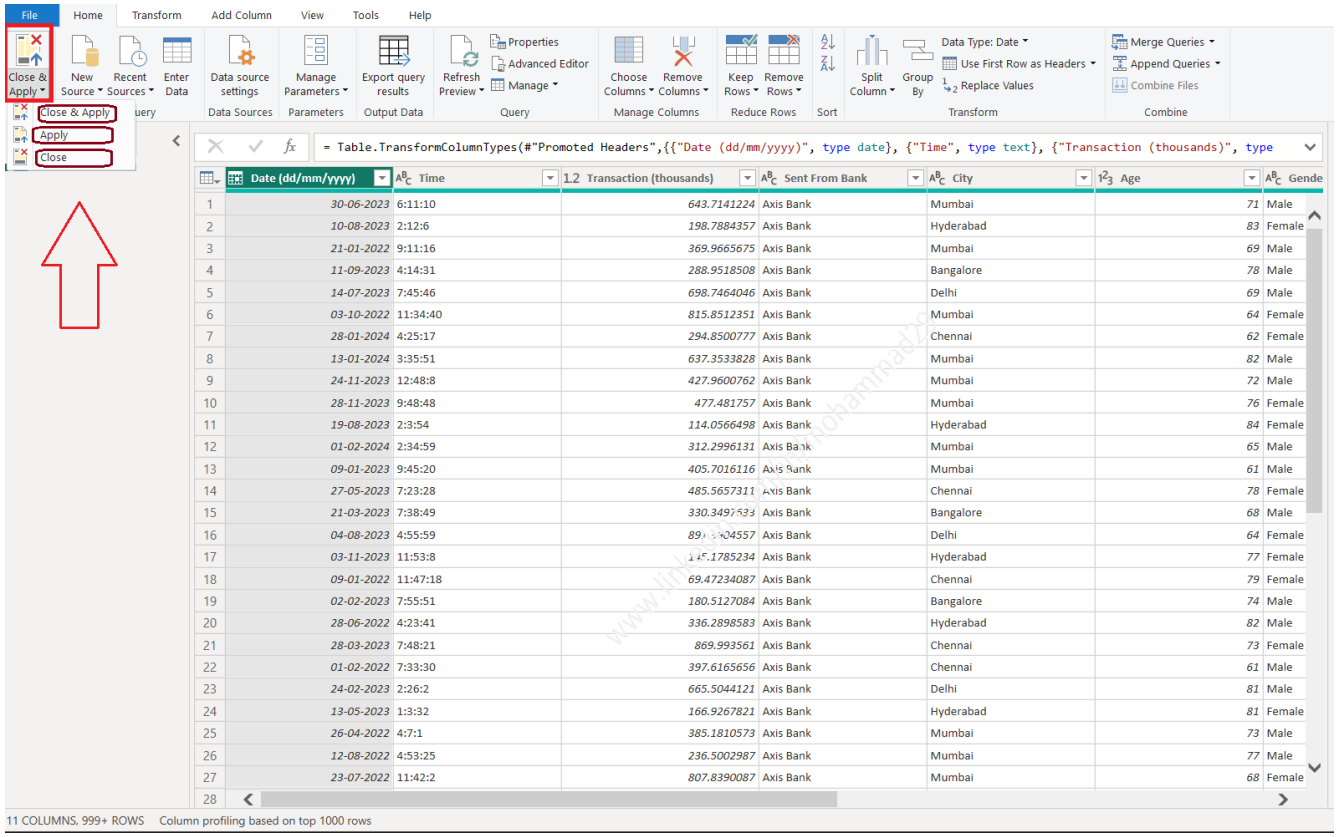


Here, we also have the **"Close & Apply"** options under the **Home** tab.

- **Close & Apply:** If you have made changes in the Power Query Editor and want to return to the Report view, select Close & Apply. This applies all the transformations and loads the updated data into the model.

- **Apply:** If you have made changes in the Power Query Editor and want to stay in the Power Query Editor, simply click Apply. This saves the changes without leaving the editor.

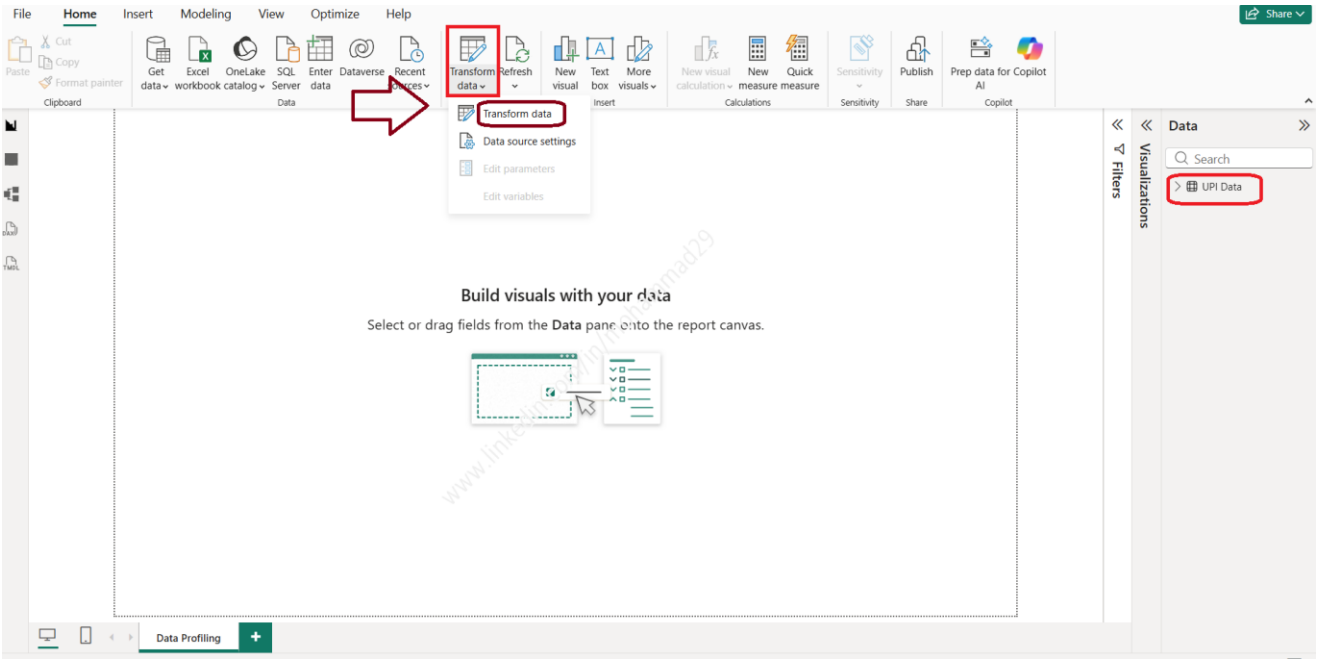
- **Close:** If you have made changes in the Power Query Editor but do not want to apply them, select Close. This closes the editor without saving the recent changes.

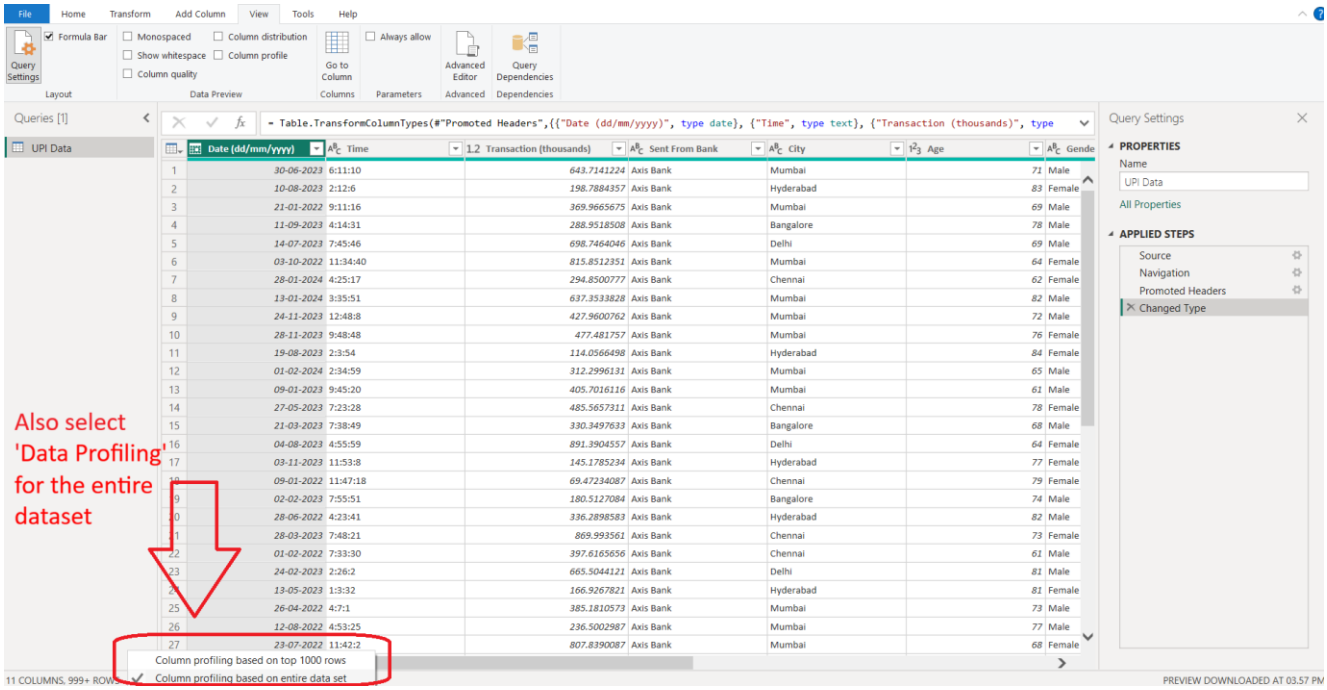


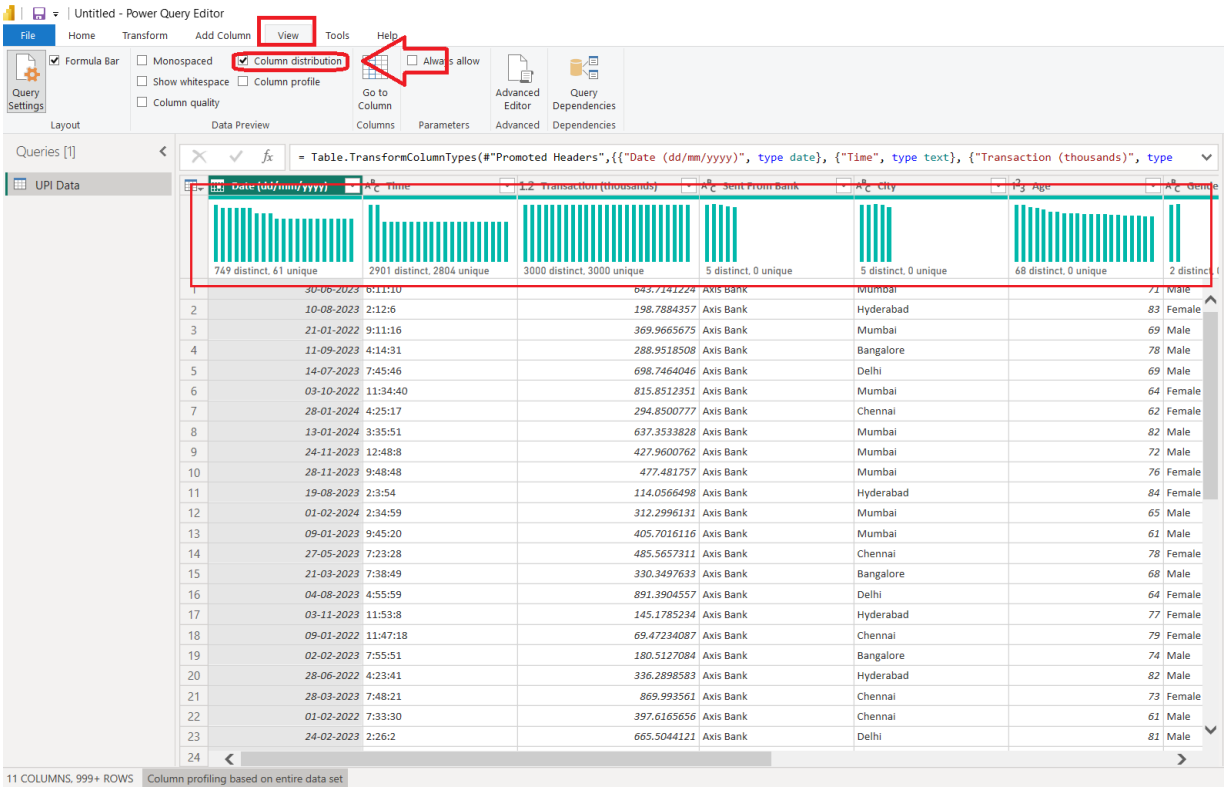
2.1. Data Profiling

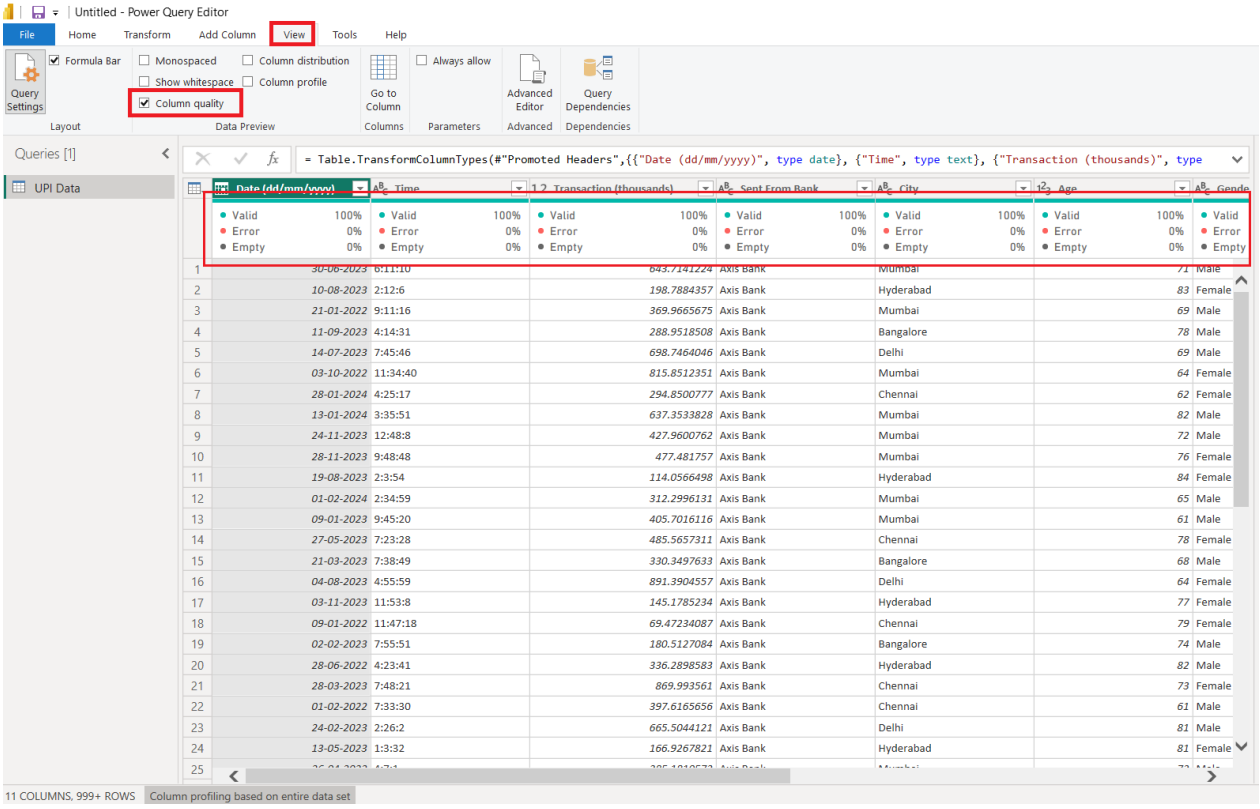
Data profiling helps us to understand our data better, and thus it will become easier for us to accurately represent the insights using the report and the dashboard.

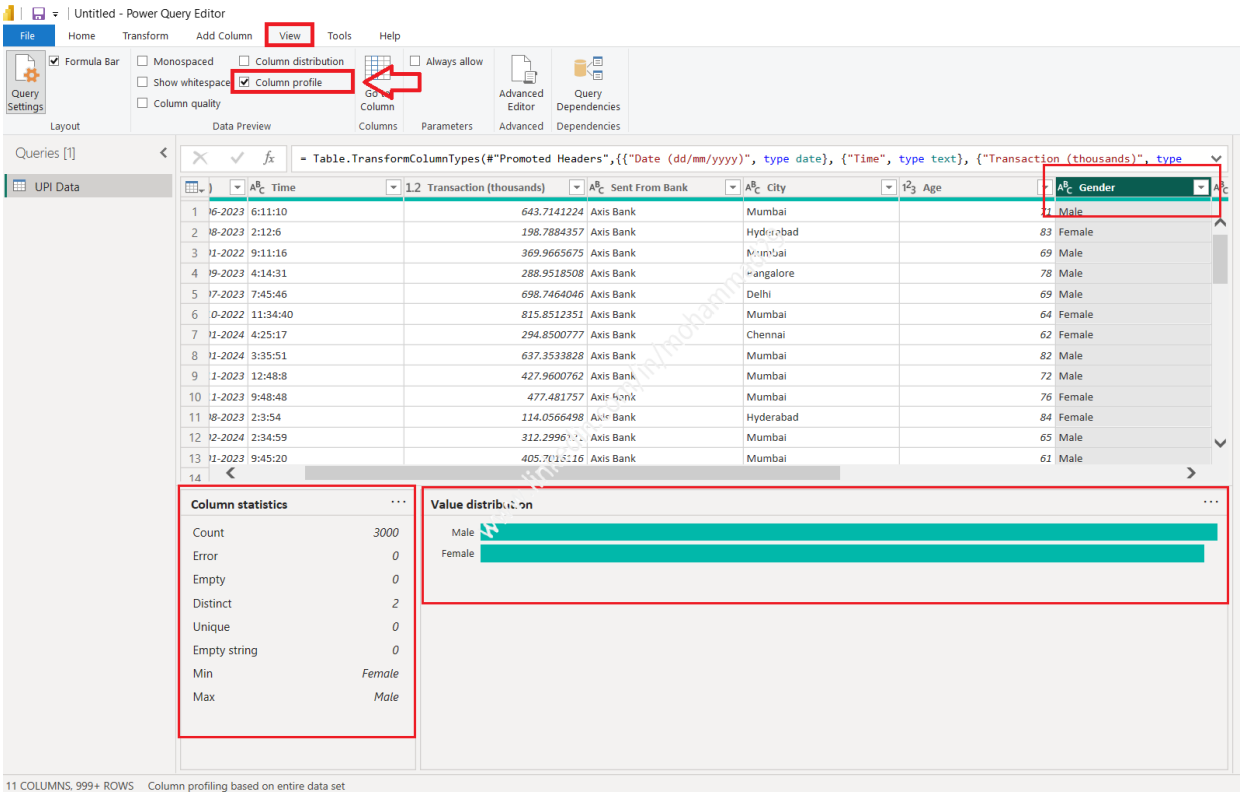
Other way to go Power Query Editor:



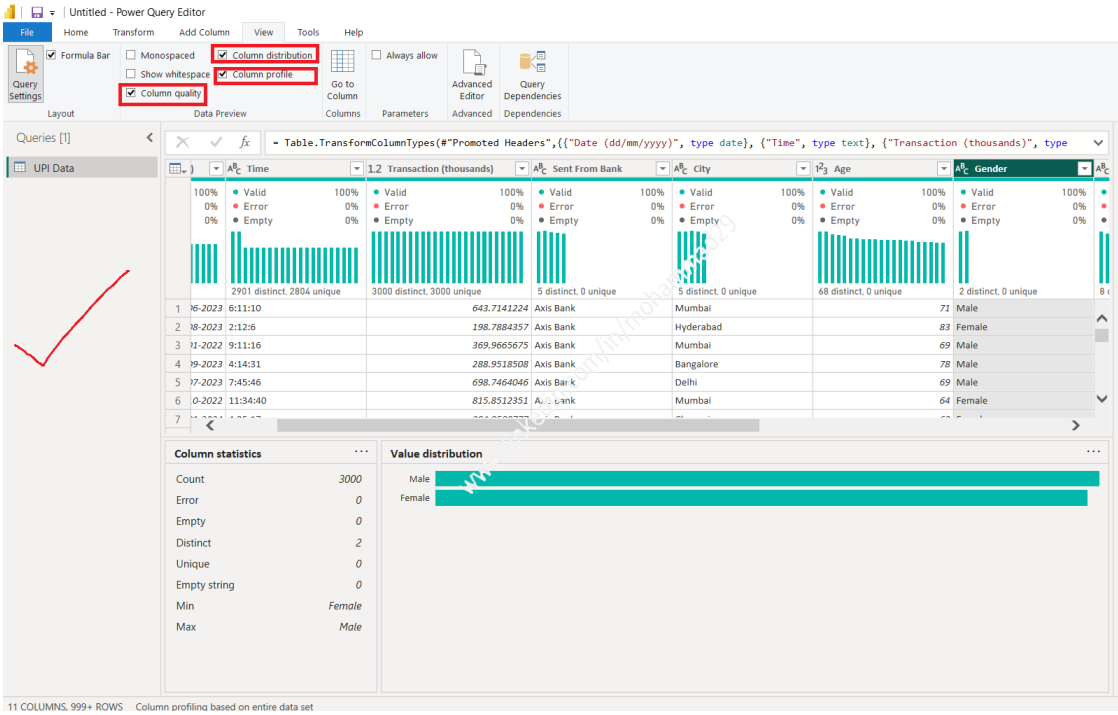



Untitled - Power Query Editor
File
Home
Transform
Add Column
View
Tools
Help
Formula Bar
Monospaced
Column distribution
Always allow
Show whitespace
Column profile
Column quality
Query Settings
Layout
Data Preview
Go to Column
Columns
Parameters
Advanced Editor
Advanced
Query Dependencies
Dependencies
Queries [1]
UPI Data
= Table.TransformColumnTypes(#"Promoted Headers",{{"Date (dd/mm/yyyy)", type date}, {"Time", type text}, {"Transaction (thousands)", type
Date (dd/mm/yyyy)
Time
Transaction (thousands)
Sent From Bank
City
Age
Gende
749 distinct, 61 unique
2901 distinct, 2804 unique
3000 distinct, 3000 unique
5 distinct, 0 unique
5 distinct, 0 unique
68 distinct, 0 unique
11 COLUMNS, 999+ ROWS
Column profiling based on entire data set


Untitled - Power Query Editor
File
Home
Transform
Add Column
View
Tools
Help
Formula Bar
Monospaced
Column distribution
Always allow
Show whitespace
Column profile
Column quality
Query Settings
Layout
Data Preview
Go to Column
Columns
Parameters
Advanced Editor
Advanced
Query Dependencies
Dependencies
Queries [1]
UPI Data
= Table.TransformColumnTypes(#"Promoted Headers",{{"Date (dd/mm/yyyy)", type date}, {"Time", type text}, {"Transaction (thousands)", type
Date (dd/mm/yyyy)
Time
Transaction (thousands)
Sent From Bank
City
Age
Gende
Valid 100%
Error 0%
Empty 0%
11 COLUMNS, 999+ ROWS
Column profiling based on entire data set



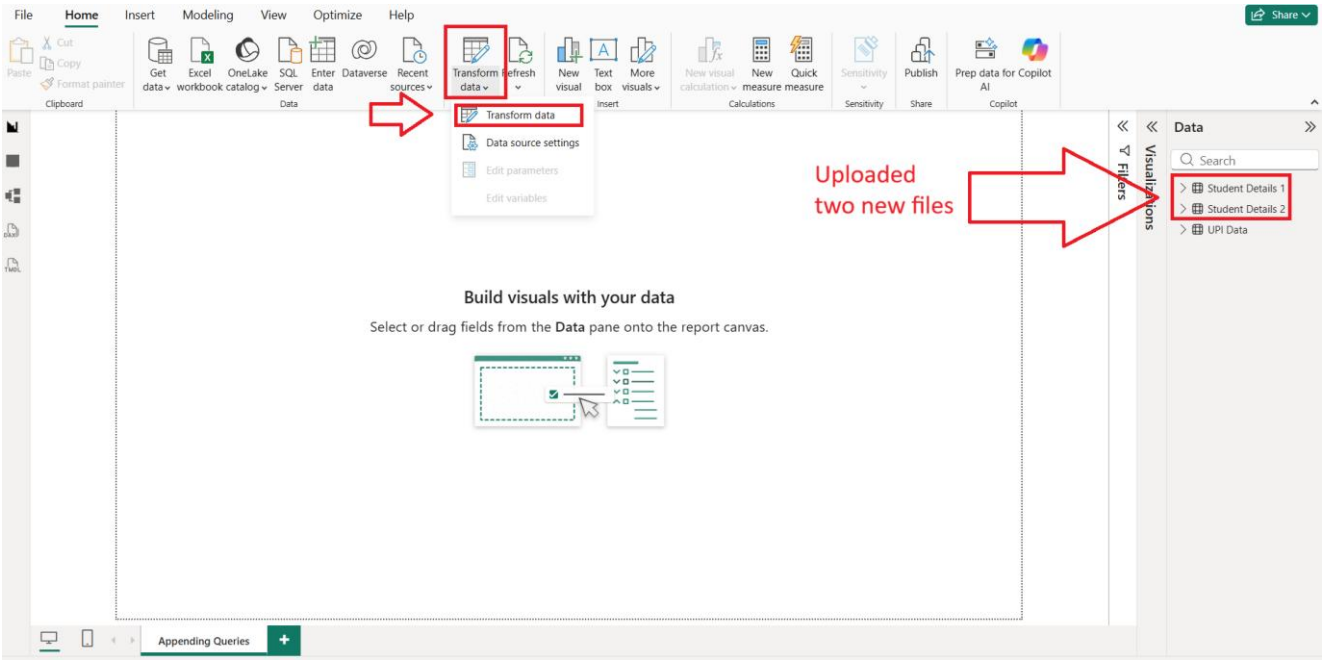
All three in one:



This is how we can use these three options to get a better understanding of your data and once we get a better understanding, better idea of your data, it will become easier for us to create accurate reports, and it will become easier for us to accurately represent the insights or information through visuals.

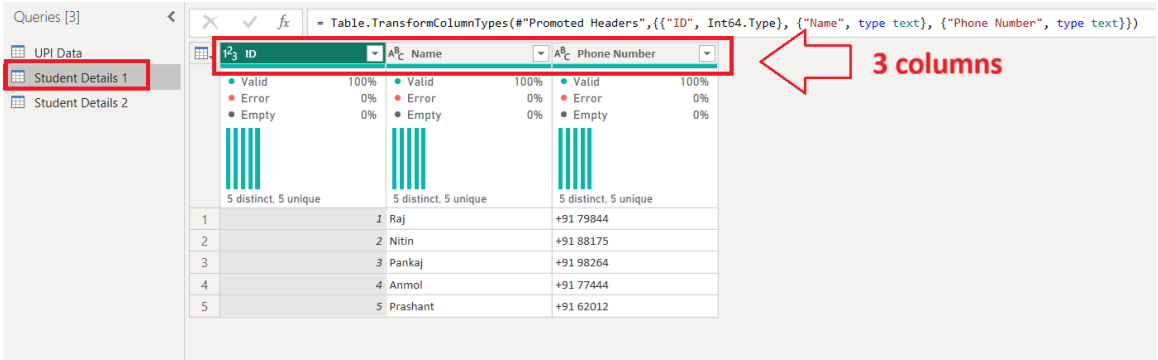
2.2. Appending Queries

So at times there can be situations where we have multiple tables or multiple queries in our dataset and it may be required to combine them i.e to append them.

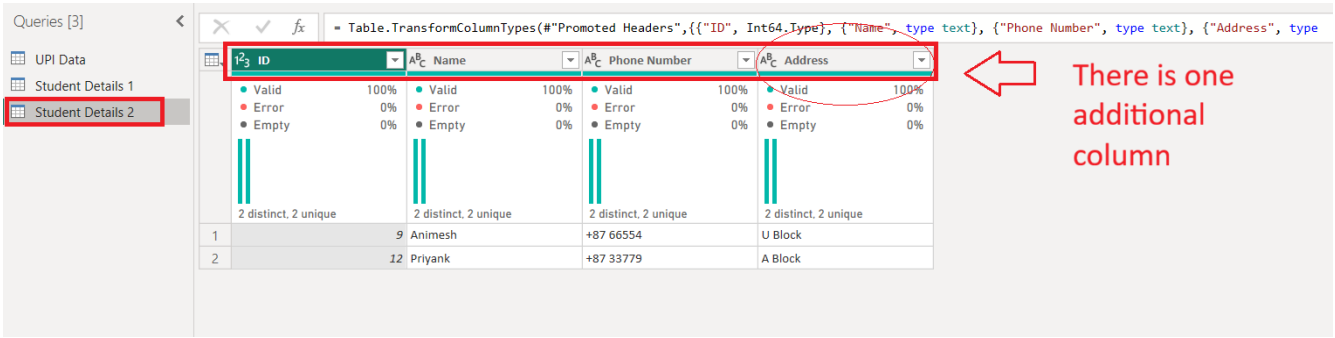


First of all let's understand the data.

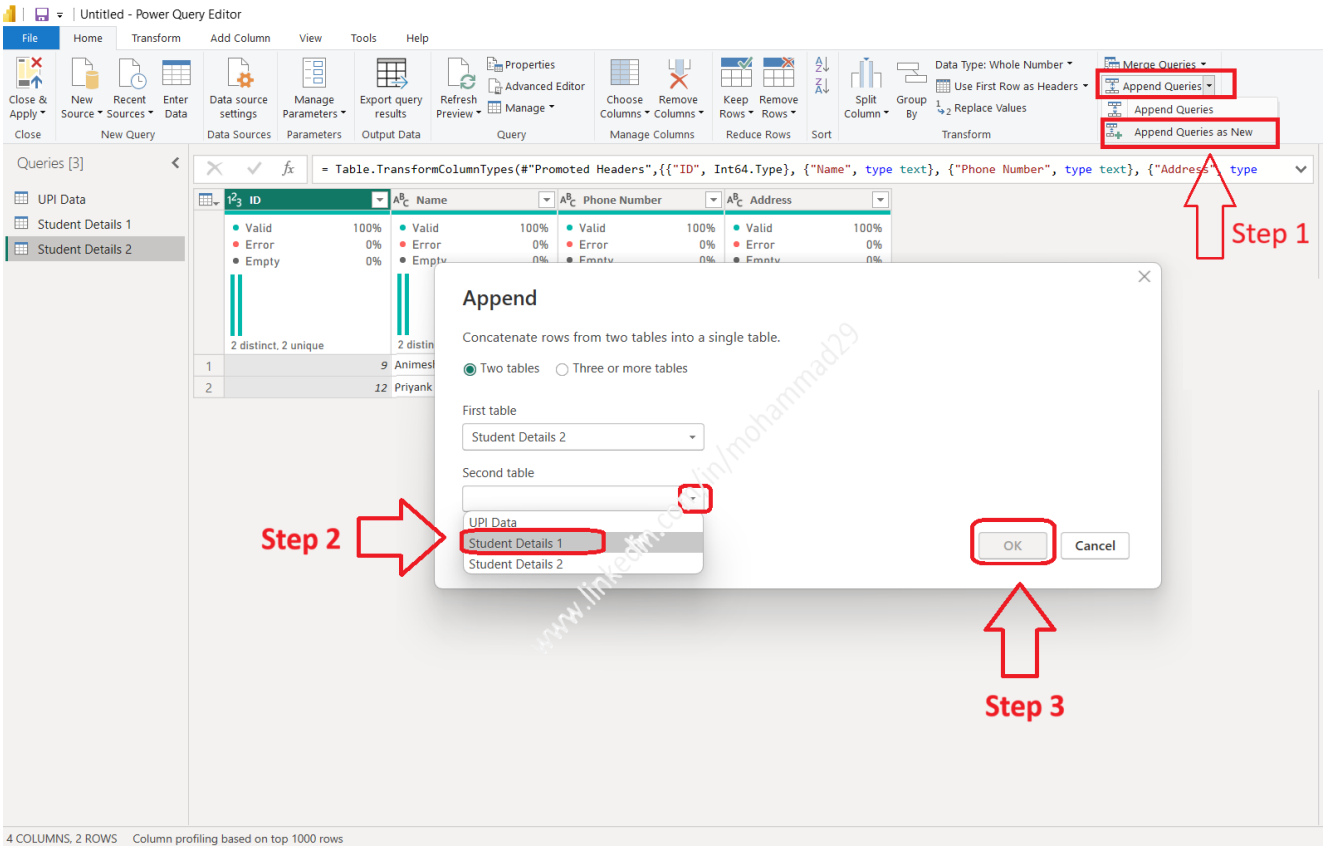
- Dataset 1



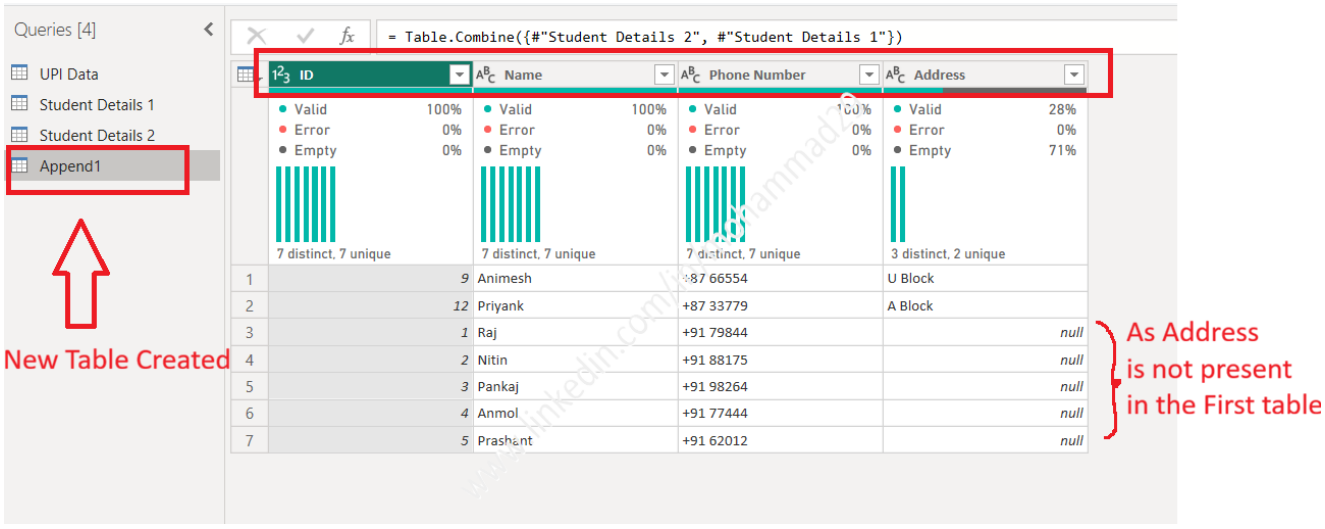
- Dataset 2



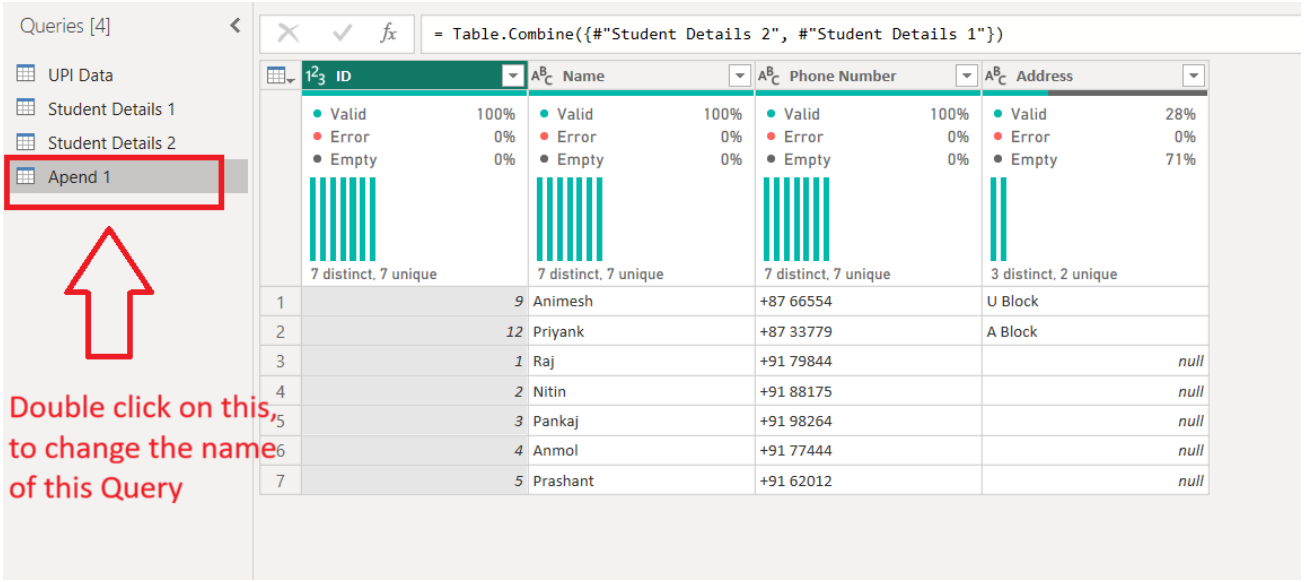
Under this **home tab** we can see there is a section called **'combined section'**.



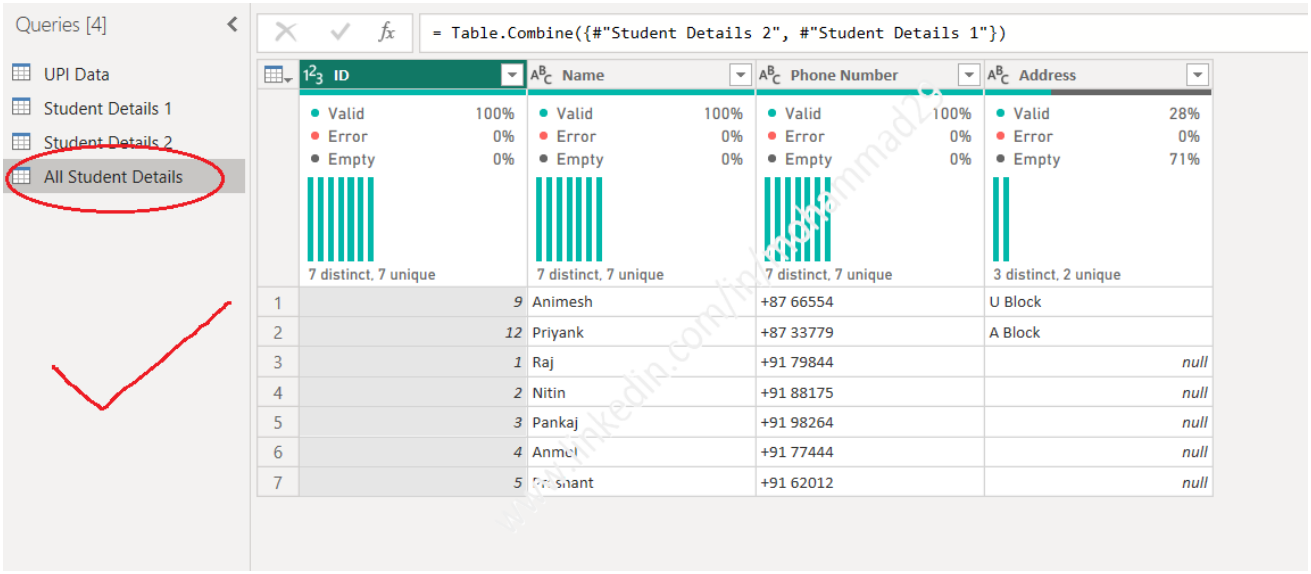
It will be creating a Query for us that will be having all four columns.



If we want to change the name, of the appended query:



Name is updated!

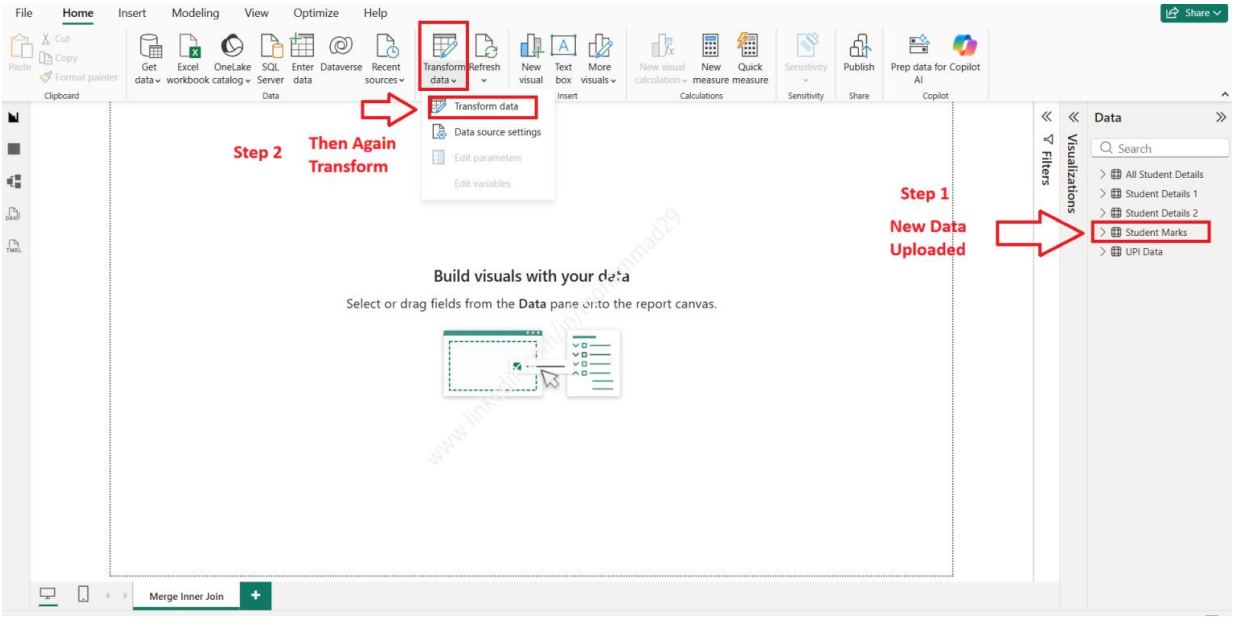


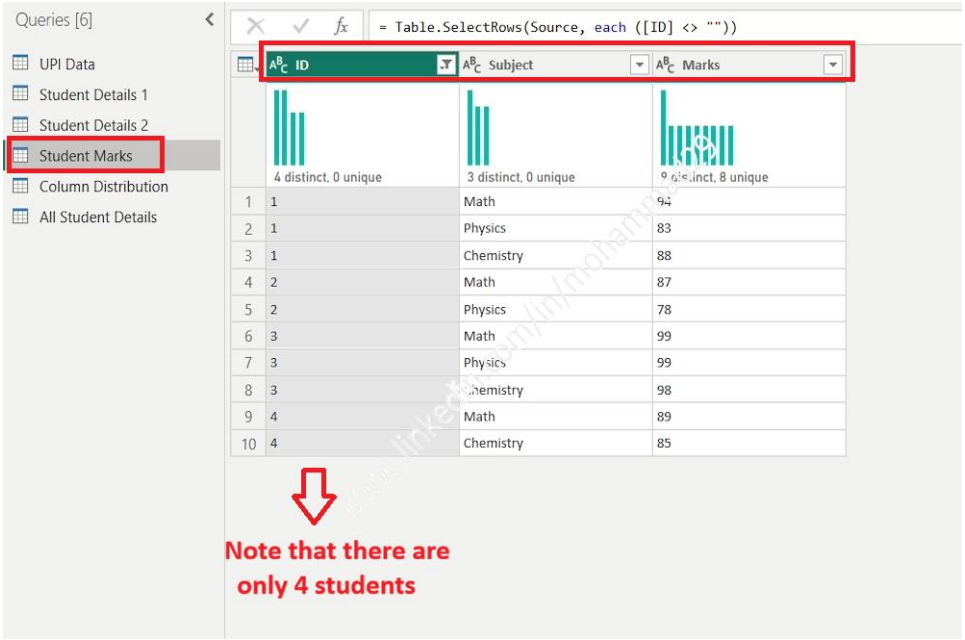
2.3. Merge Queries

2.3.1. Inner Join

So at times there can be situations where we have multiple tables or multiple queries in our dataset and it may be required to combine them i.e to append them.

Uploaded one more dataset





- Inner Join (Example)

All Student Details

ID	Name	ph.No.	Add
1	A	X	null
2	B	Y	null
3	C	Z	CZ3

Student Marks

ID	Subject	Marks
1	Math	97
1	English	96
2	Math	99

INNER JOIN

ID	Name	Ph No.	Add	ID	Subject	Marks
1	A	X	null	1	Math	97
1	A	X	null	1	English	96
2	B	Y	null	2	Math	99

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Inner Join Practical in Power BI

Here we have two table

i. Student Marks
ii. All Student Details

Student Marks

	ID	Subject	Marks
1	1	Math	94
2	1	Physics	83
3	1	Chemistry	88
4	2	Math	87
5	2	Physics	78
6	3	Math	94
7	3	Physics	59
8	3	Chemistry	98
9	4	Math	89
10	4	Chemistry	85

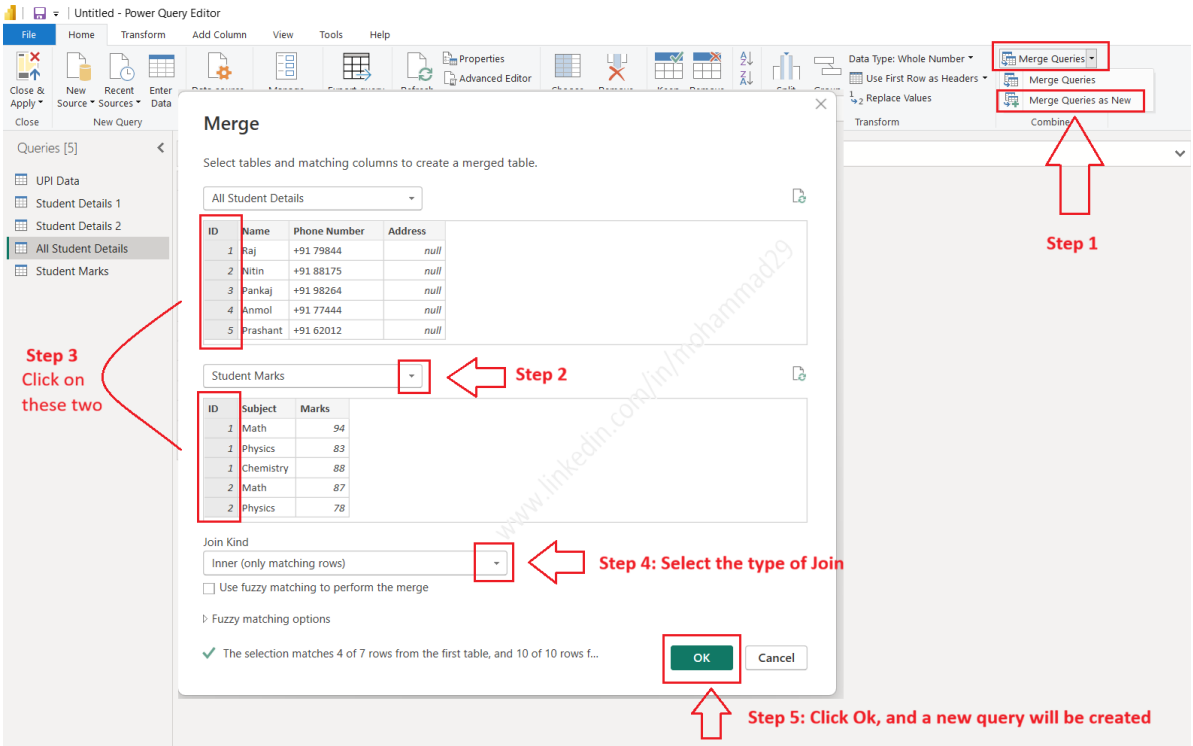
All Student Details

	ID	Name	Phone Number	Address
1	9	Animesh	+87 66554	U Block
2	12	Priyank	+87 33779	A Block
3	1	Raj	+91 79844	null
4	2	Nitin	+91 88175	null
5	3	Pankaj	+91 98264	null
6	4	Anmol	+91 77444	null
7	5	Prashant	+91 62012	null

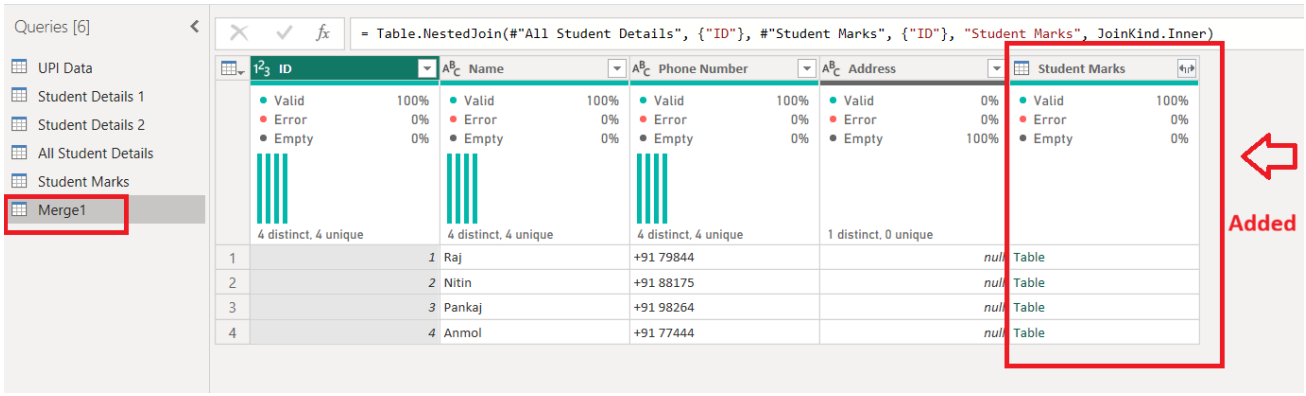
Here we want to apply the inner join or the inner join merge operation and

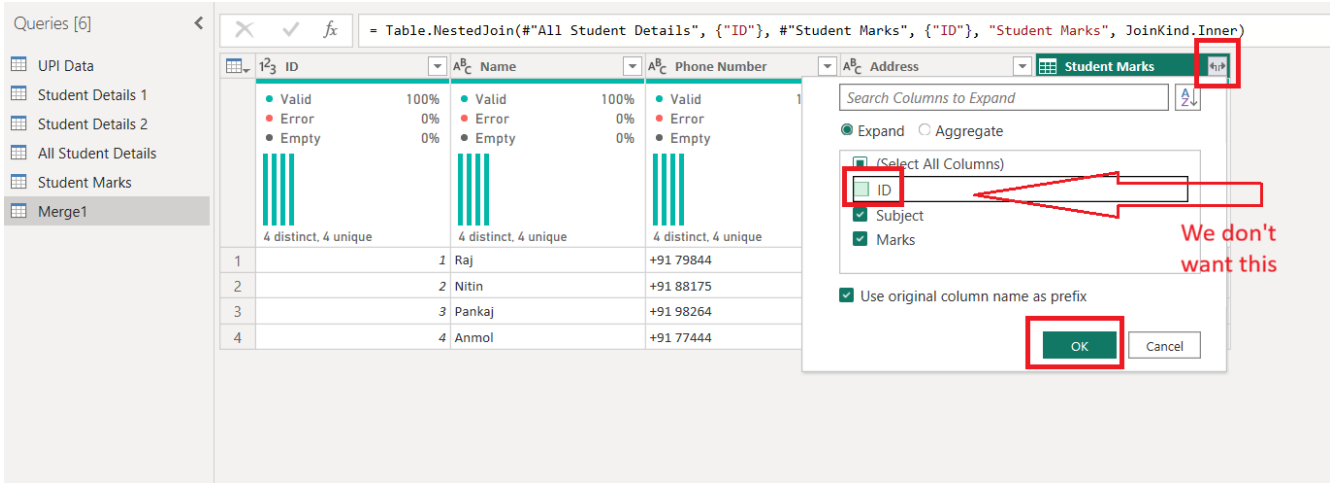
- we want **all these four columns** from 'All Student Details' table
- and from 'student marks' table we **want only 2 columns** i.e *subject* and *marks* column.

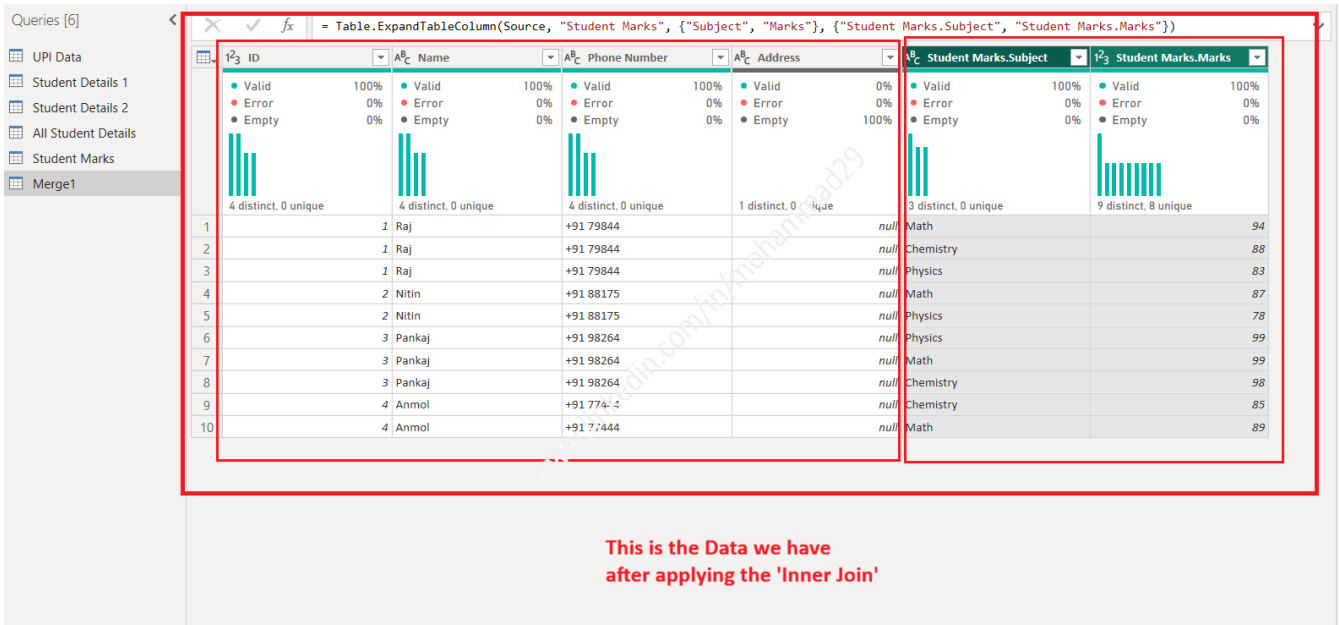
That means we are merging these two tables based on the common column i.e ID.



Output: is the Inner join of the two tables

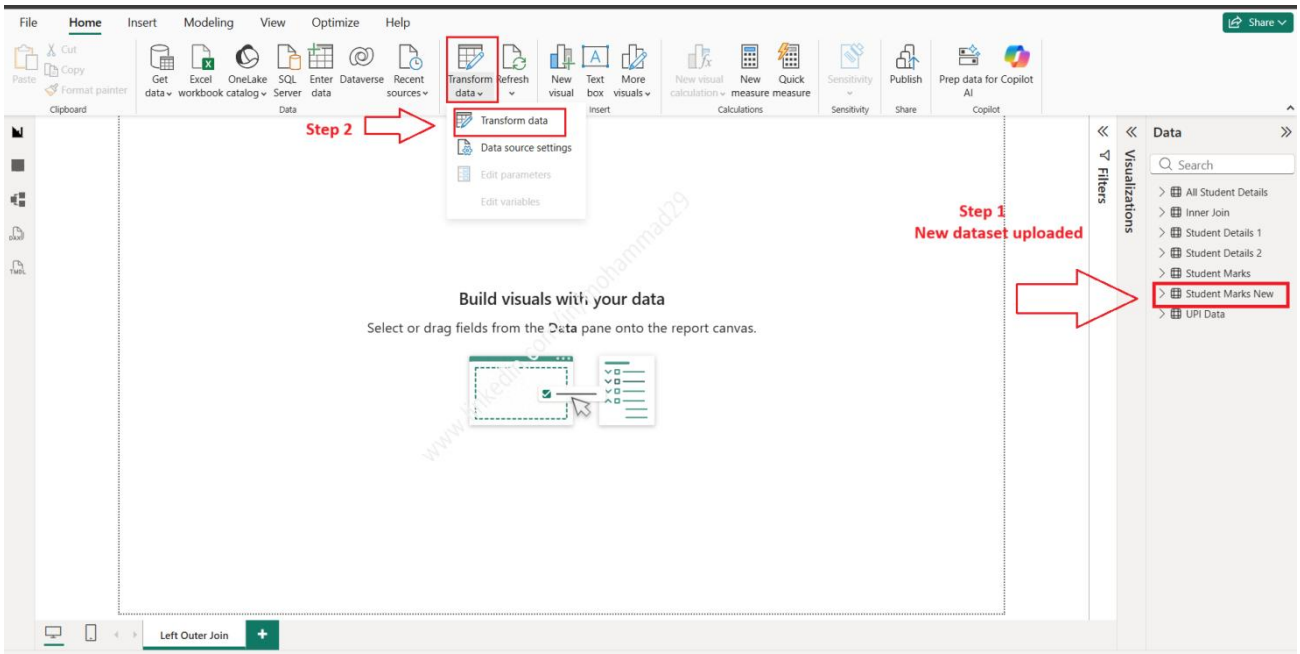


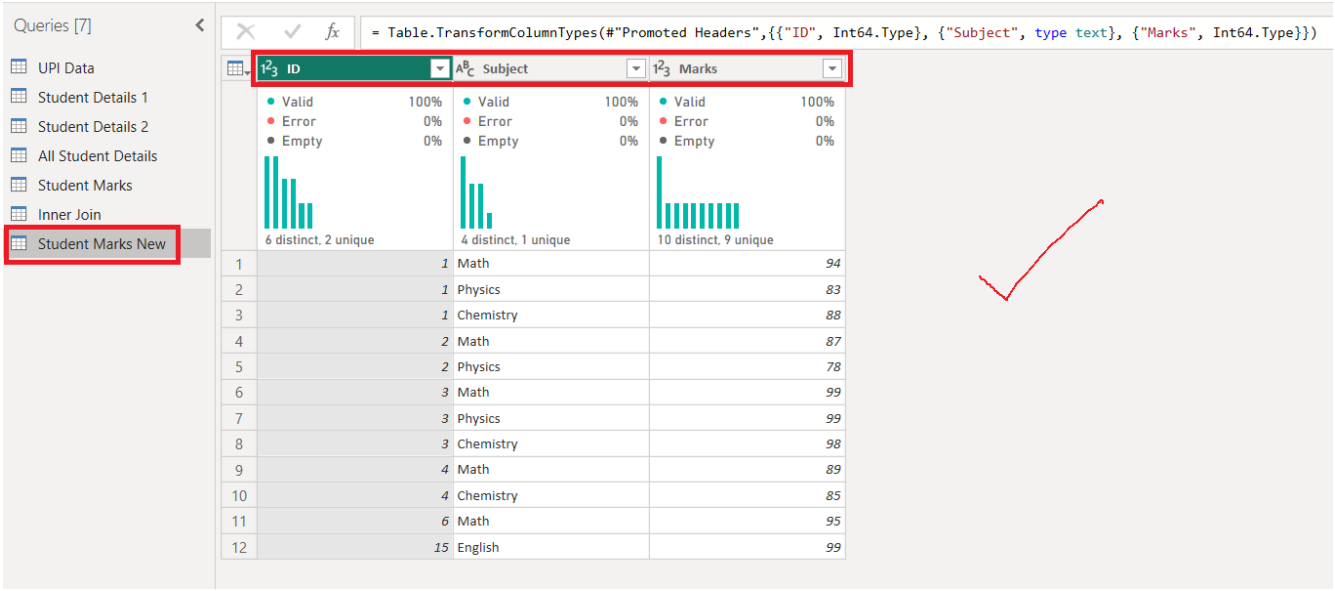




2.3.2. Left Outer Join

Uploaded one more dataset





	ID	Subject	Marks
1	1	Math	94
2	1	Physics	83
3	1	Chemistry	88
4	2	Math	87
5	2	Physics	78
6	3	Math	99
7	3	Physics	99
8	3	Chemistry	98
9	4	Math	89
10	4	Chemistry	85
11	6	Math	95
12	15	English	99

- Left Outer Join (Example)

1st Table

ID	Name	Ph.No.	Add.
1	A	X	null
2	B	Y	null
3	C	Z	CZ3

2nd Table

ID	Subject	Marks
1	English	79
1	Math	97
2	English	89
6	Math	78
15	English	88

LEFT OUTER JOIN

ID	Name	Ph.No.	Add.	ID	Sub	Marks
1	A	X	null	1	English	79
1	A	X	null	1	Math	97
2	B	Y	null	2	English	89
3	C	Z	CZ3	null	null	null

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Left outer join Practical in Power BI

Here we have two table

i. All Student Details
ii. Students Marks New

All Student Details

	ID	Name	Phone Number	Address
Valid	100%	100%	100%	28%
Error	0%	0%	0%	0%
Empty	0%	0%	0%	71%
	7 distinct, 7 unique	7 distinct, 7 unique	7 distinct, 7 unique	3 distinct, 2 unique
1	1	Raj	+91 79844	null
2	2	Nitin	+91 88175	null
3	3	Pankaj	+91 98264	null
4	4	Anmol	+91 77444	null
5	5	Prashant	+91 62012	null
6	9	Animesh	+87 66554	U Block
7	12	Priyank	+87 33779	A Block

Students Marks New

	ID	Subject	Marks
Valid	100%	100%	100%
Error	0%	0%	0%
Empty	0%	0%	0%
	6 distinct, 2 unique	4 distinct, 1 unique	10 distinct, 9 unique
1	1	Math	94
2	1	Physics	83
3	1	Chemistry	88
4	2	Math	87
5	2	Physics	78
6	3	Math	99
7	3	Physics	99
8	3	Chemistry	98
9	4	Math	89
10	4	Chemistry	85
11	6	Math	95
12	15	English	99

Join Kind

Left Outer (all from first, matching from second)

	ID	Name	Phone Number	Address	Student Marks New.Subject	Student Marks New.Marks
Valid	100%	100%	100%	15%	77%	77%
Error	0%	0%	0%	0%	0%	0%
Empty	0%	0%	0%	85%	23%	23%
	7 distinct, 3 unique	7 distinct, 3 unique	7 distinct, 3 unique	3 distinct, 2 unique	4 distinct, 0 unique	10 distinct, 8 unique
1	1	Raj	+91 79844	null	Math	94
2	1	Raj	+91 79844	null	Chemistry	88
3	1	Raj	+91 79844	null	Physics	83
4	2	Nitin	+91 88175	null	Math	87
5	2	Nitin	+91 88175	null	Physics	78
6	3	Pankaj	+91 98264	null	Physics	99
7	3	Pankaj	+91 98264	null	Math	99
8	3	Pankaj	+91 98264	null	Chemistry	98
9	4	Anmol	+91 77444	null	Chemistry	85
10	4	Anmol	+91 77444	null	Math	89
11	5	Prashant	+91 62012	null	null	null
12	9	Animesh	+87 66554	U Block	null	null
13	12	Priyank	+87 33779	A Block	null	null

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2.3.3. Right Outer Join

- **Right Outer Join (Example)**

1st Table

ID	Name	Ph.No.	Add.
1	A	X	null
2	B	Y	null
3	C	Z	CZ3

2nd Table

ID	Subject	Marks
1	English	79
1	Math	97
2	English	89
6	Math	78
15	English	88

Right outer Join

ID	Name	Ph.	Add.	ID	Subject	Marks
1	A	X	Null	1	English	79
1	A	X	Null	1	Math	97
2	B	Y	Null	2	English	89
null	null	null	null	6	Math	78
null	null	null	null	15	English	88

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Right outer Join Practical in Power BI

Here we have two table

i. All Student Details
ii. Students Marks New

All Student Details

	ID	Name	Phone Number	Address
Valid	100%	100%	100%	28%
Error	0%	0%	0%	0%
Empty	0%	0%	0%	71%
	7 distinct, 7 unique	7 distinct, 7 unique	7 distinct, 7 unique	3 distinct, 2 unique
1	1	Raj	+91 79844	null
2	2	Nitin	+91 88175	null
3	3	Pankaj	+91 98264	null
4	4	Anmol	+91 77444	null
5	5	Prashant	+91 62012	null
6	9	Animesh	+87 66554	U Block
7	12	Priyank	+87 33779	A Block

Students Marks New

	ID	Subject	Marks
Valid	100%	100%	100%
Error	0%	0%	0%
Empty	0%	0%	0%
	6 distinct, 2 unique	4 distinct, 1 unique	10 distinct, 9 unique
1	1	Math	94
2	1	Physics	83
3	1	Chemistry	88
4	2	Math	87
5	2	Physics	78
6	3	Math	99
7	3	Physics	99
8	3	Chemistry	98
9	4	Math	89
10	4	Chemistry	85
11	6	Math	95
12	15	English	99

Join Kind

Right Outer (all from second, matching from first)

	ID	Name	Phone Number	Address	Student Marks New.Subject	Student Marks New.Marks
Valid	83%	83%	83%	0%	100%	100%
Error	0%	0%	0%	0%	0%	0%
Empty	17%	17%	17%	100%	0%	0%
	5 distinct, 0 unique	5 distinct, 0 unique	5 distinct, 0 unique	1 distinct, 0 unique	4 distinct, 1 unique	10 distinct, 9 unique
1	null	null	null	null	English	99
2	null	null	null	null	Math	95
3	1	Raj	+91 79844	null	Chemistry	88
4	1	Raj	+91 79844	null	Math	94
5	1	Raj	+91 79844	null	Physics	83
6	2	Nitin	+91 88175	null	Math	87
7	2	Nitin	+91 88175	null	Physics	78
8	3	Pankaj	+91 98264	null	Physics	99
9	3	Pankaj	+91 98264	null	Math	99
10	3	Pankaj	+91 98264	null	Chemistry	98
11	4	Anmol	+91 77444	null	Chemistry	85
12	4	Anmol	+91 77444	null	Math	89

2.3.4. Left & Right Anti Join

- **Left Anti Join (Example)**

1st Table

ID	Name	ph.No.	Add.
1	A	X	null
2	B	Y	null
3	C	Z	CZ3

2nd Table

ID	Subject	Marks
1	English	79
1	Math	97
2	English	89
6	Math	78
15	English	88

Left Anti Join

ID	Name	ph.No.	Add.	ID	Subject	Marks
3	C	Z	CZ3	null	null	null

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Left Anti Join Practical in Power BI

Here we have two table:

i. All Student Details
ii. Students Marks New

All Student Details

	ID	Name	Phone Number	Address
Valid	100%	100%	100%	28%
Error	0%	0%	0%	0%
Empty	0%	0%	0%	71%
	7 distinct, 7 unique	7 distinct, 7 unique	7 distinct, 7 unique	3 distinct, 2 unique
1	1	Raj	+91 79844	null
2	2	Nitin	+91 88175	null
3	3	Pankaj	+91 98264	null
4	4	Anmol	+91 77444	null
5	5	Prashant	+91 62012	null
6	9	Animesh	+87 66554	U Block
7	12	Priyank	+87 33779	A Block

Students Marks New

	ID	Subject	Marks
Valid	100%	100%	100%
Error	0%	0%	0%
Empty	0%	0%	0%
	6 distinct, 2 unique	4 distinct, 1 unique	10 distinct, 9 unique
1	1	Math	94
2	1	Physics	83
3	1	Chemistry	88
4	2	Math	87
5	2	Physics	78
6	3	Math	99
7	3	Physics	99
8	3	Chemistry	98
9	4	Math	89
10	4	Chemistry	85
11	6	Math	95
12	15	English	99

Join Kind

Left Anti (rows only in first)

	ID	Name	Phone Number	Address	Student Marks New.Subject	Student Marks New.Marks
Valid	100%	100%	100%	67%	0%	0%
Error	0%	0%	0%	0%	0%	0%
Empty	0%	0%	0%	33%	100%	100%
	3 distinct, 3 unique	3 distinct, 3 unique	3 distinct, 3 unique	3 distinct, 3 unique	1 distinct, 0 unique	1 distinct, 0 unique
1	5	Prashant	+91 62012	null	null	null
2	9	Animesh	+87 66554	U Block	null	null
3	12	Priyank	+87 33779	A Block	null	null

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- **Right Anti Join (Example)**

1st Table

ID	Name	Ph.No.	Add.
1	A	X	null
2	B	Y	null
3	C	Z	CZ3

2nd Table

ID	Subject	Marks
1	English	79
1	Math	97
2	English	89
6	Math	78
15	English	88

Right Anti Join

ID	Name	Ph.No.	Add.	ID	Subject	Marks
null	null	null	null	6	Math	78
null	null	null	null	15	English	88

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Right Anti Join Practical in Power BI

Here we have two table:

iii. All Student Details
iv. Students Marks New

All Student Details

	ID	Name	Phone Number	Address
Valid	100%	100%	100%	28%
Error	0%	0%	0%	0%
Empty	0%	0%	0%	71%
	7 distinct, 7 unique	7 distinct, 7 unique	7 distinct, 7 unique	3 distinct, 2 unique
1	1	Raj	+91 79844	null
2	2	Nitin	+91 88175	null
3	3	Pankaj	+91 98264	null
4	4	Anmol	+91 77444	null
5	5	Prashant	+91 62012	null
6	9	Animesh	+87 66554	U Block
7	12	Priyank	+87 33779	A Block

Students Marks New

	ID	Subject	Marks
Valid	100%	100%	100%
Error	0%	0%	0%
Empty	0%	0%	0%
	6 distinct, 2 unique	4 distinct, 1 unique	10 distinct, 9 unique
1	1	Math	94
2	1	Physics	83
3	1	Chemistry	88
4	2	Math	87
5	2	Physics	78
6	3	Math	99
7	3	Physics	99
8	3	Chemistry	98
9	4	Math	89
10	4	Chemistry	85
11	6	Math	95
12	15	English	99

Join Kind

Right Anti (rows only in second)

	Name	Phone Number	Address	Student Marks New.ID	Student Marks New.Subject	Student Marks New.Marks
Valid	0%	0%	0%	100%	100%	100%
Error	0%	0%	0%	0%	0%	0%
Empty	100%	100%	100%	0%	0%	0%
	1 distinct, 0 unique	1 distinct, 0 unique	1 distinct, 0 unique	2 distinct, 2 unique	2 distinct, 2 unique	2 distinct, 2 unique
1	null	null	null	15	English	99
2	null	null	null	6	Math	95

2.3.5. Full Outer Join

- **Full Outer Join (Example)**

1st Table

ID	Name	Ph.No.	Add.
1	A	X	null
2	B	Y	null
3	C	Z	CZ3

2nd Table

ID	Subject	Marks
1	English	79
1	Math	97
2	English	89
6	Math	78
15	English	88

FULL OUTER JOIN

ID	Name	Ph.No.	Add.	ID	Subject	Marks
1	A	X	null	1	English	79
1	A	X	null	1	Math	97
2	B	Y	null	2	English	89
3	C	Z	CZ3	null	null	null
null	null	null	null	6	Math	78
null	null	null	null	15	English	88

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Full Outer Join Practical in Power BI

Here we have two table:

i. All Student Details
ii. Students Marks New

All Student Details

	ID	Name	Phone Number	Address
Valid	100%	100%	100%	28%
Error	0%	0%	0%	0%
Empty	0%	0%	0%	71%
	7 distinct, 7 unique	7 distinct, 7 unique	7 distinct, 7 unique	3 distinct, 2 unique
1	1	Raj	+91 79844	null
2	2	Nitin	+91 88175	null
3	3	Pankaj	+91 98264	null
4	4	Anmol	+91 77444	null
5	5	Prashant	+91 62012	null
6	9	Animesh	+87 66554	U Block
7	12	Priyank	+87 33779	A Block

Students Marks New

	ID	Subject	Marks
Valid	100%	100%	100%
Error	0%	0%	0%
Empty	0%	0%	0%
	6 distinct, 2 unique	4 distinct, 1 unique	10 distinct, 9 unique
1	1	Math	94
2	1	Physics	83
3	1	Chemistry	88
4	2	Math	87
5	2	Physics	78
6	3	Math	99
7	3	Physics	99
8	3	Chemistry	98
9	4	Math	89
10	4	Chemistry	85
11	6	Math	95
12	15	English	99

Join Kind

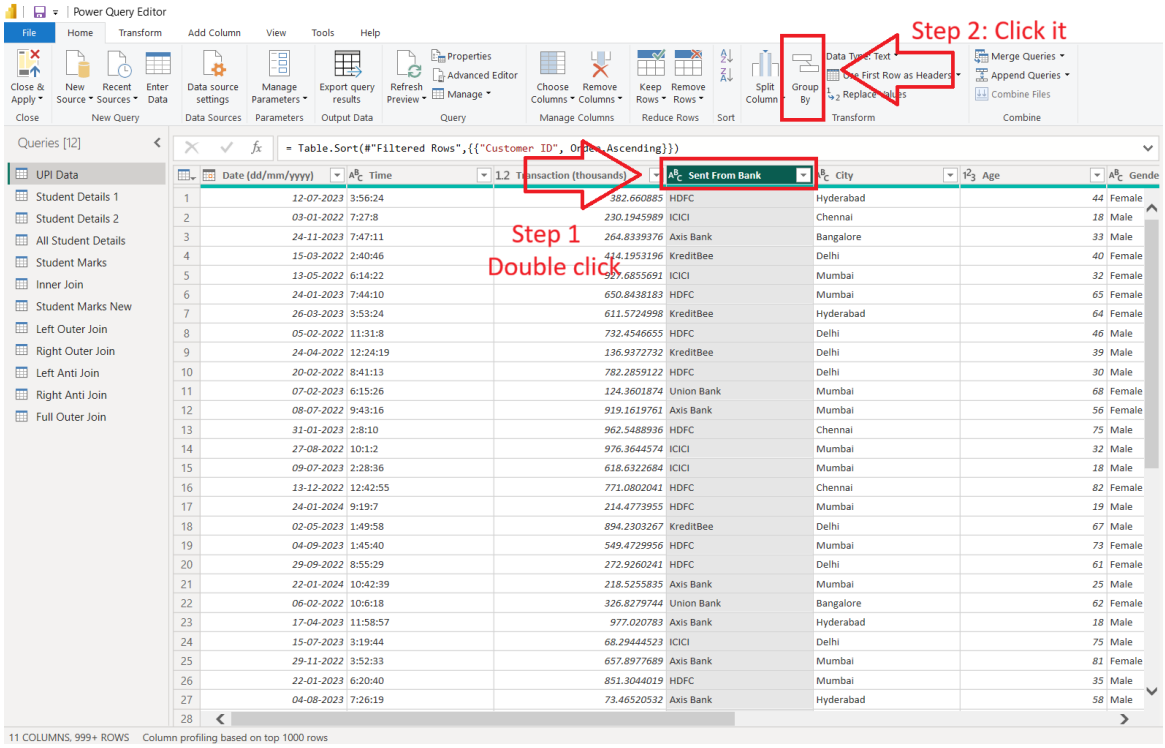
Full Outer (all rows from both)

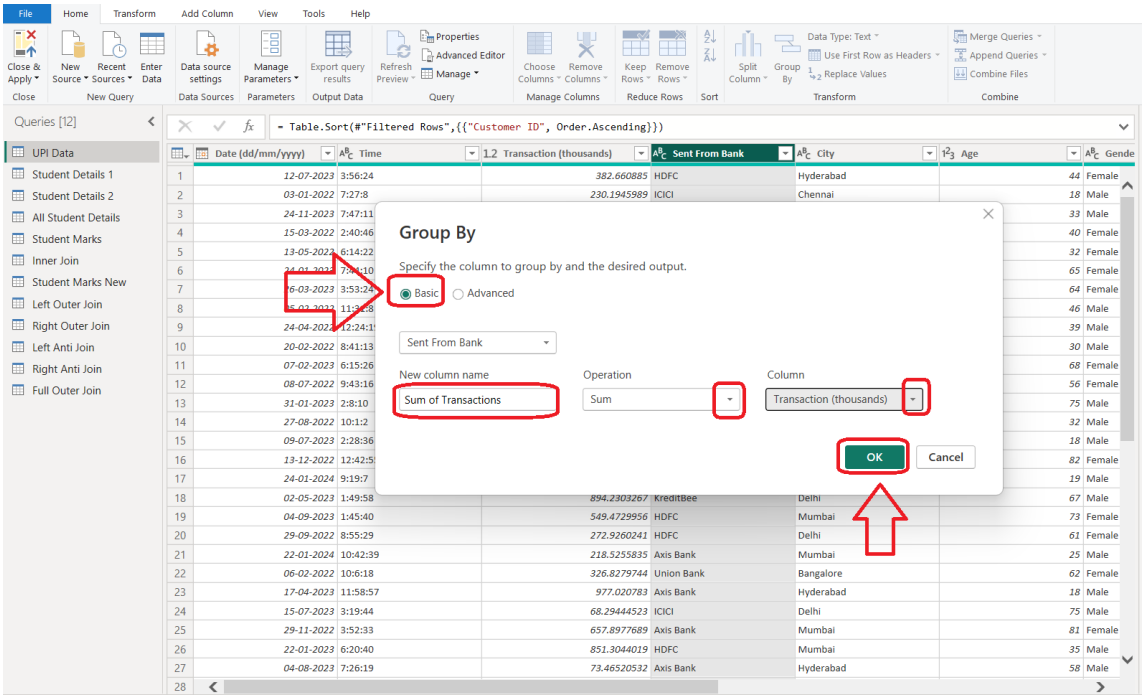
	ID	Name	Phone Number	Address	Student Marks New.ID	Student Marks New.Subject	St
Valid	87%	87%	87%	13%	80%	80%	Va
Error	0%	0%	0%	0%	0%	0%	Er
Empty	13%	13%	13%	87%	20%	20%	Em
	8 distinct, 3 unique	8 distinct, 3 unique	8 distinct, 3 unique	3 distinct, 2 unique	7 distinct, 2 unique	5 distinct, 1 unique	11 dis
1	null	null	null	null	15	English	
2	null	null	null	null	6	Math	
3	1	Raj	+91 79844	null	1	Chemistry	
4	1	Raj	+91 79844	null	1	Math	
5	1	Raj	+91 79844	null	1	Physics	
6	2	Nitin	+91 88175	null	2	Math	
7	2	Nitin	+91 88175	null	2	Physics	
8	3	Pankaj	+91 98264	null	3	Physics	
9	3	Pankaj	+91 98264	null	3	Math	
10	3	Pankaj	+91 98264	null	3	Chemistry	
11	4	Anmol	+91 77444	null	4	Math	
12	4	Anmol	+91 77444	null	4	Chemistry	
13	5	Prashant	+91 62012	null	null	null	
14	9	Animesh	+87 66554	U Block	null	null	
15	12	Priyank	+87 33779	A Block	null	null	

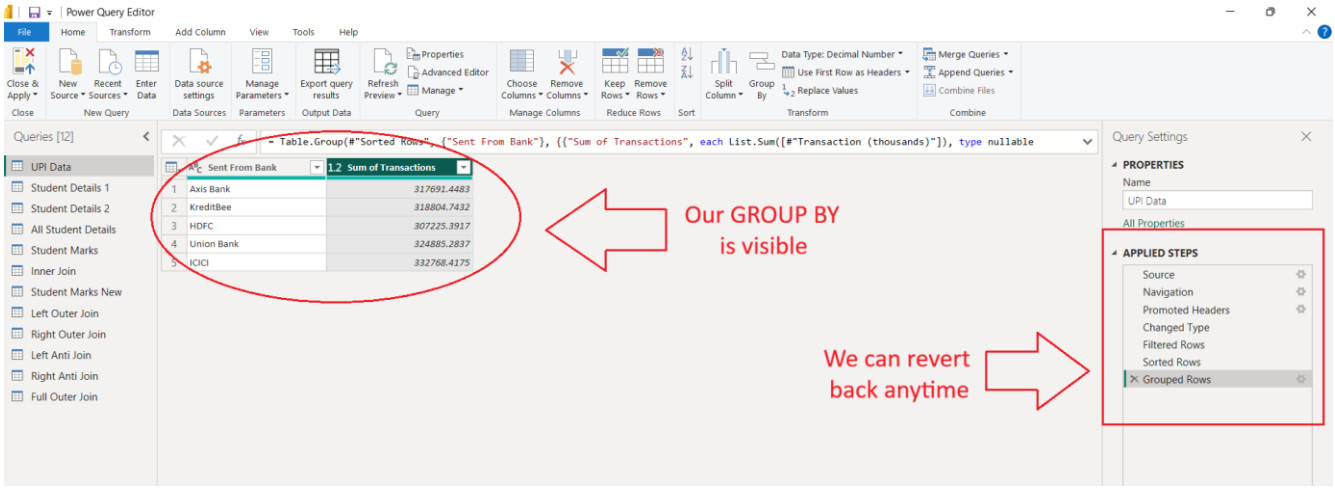
2.4. Group By in Power Query Editor

i. GROUB By on the basis of one column

Q. Find out the total transactions for all different banks we have in our Dataset.

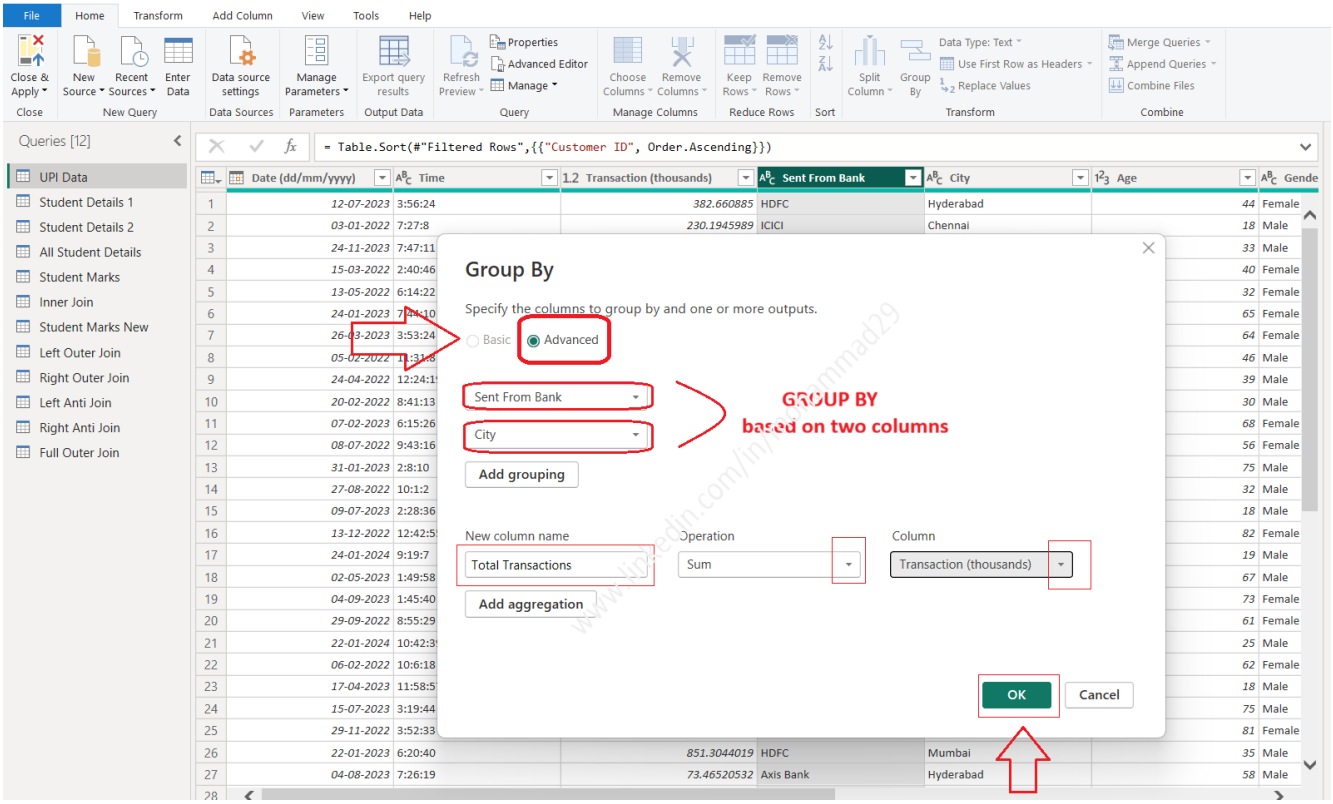




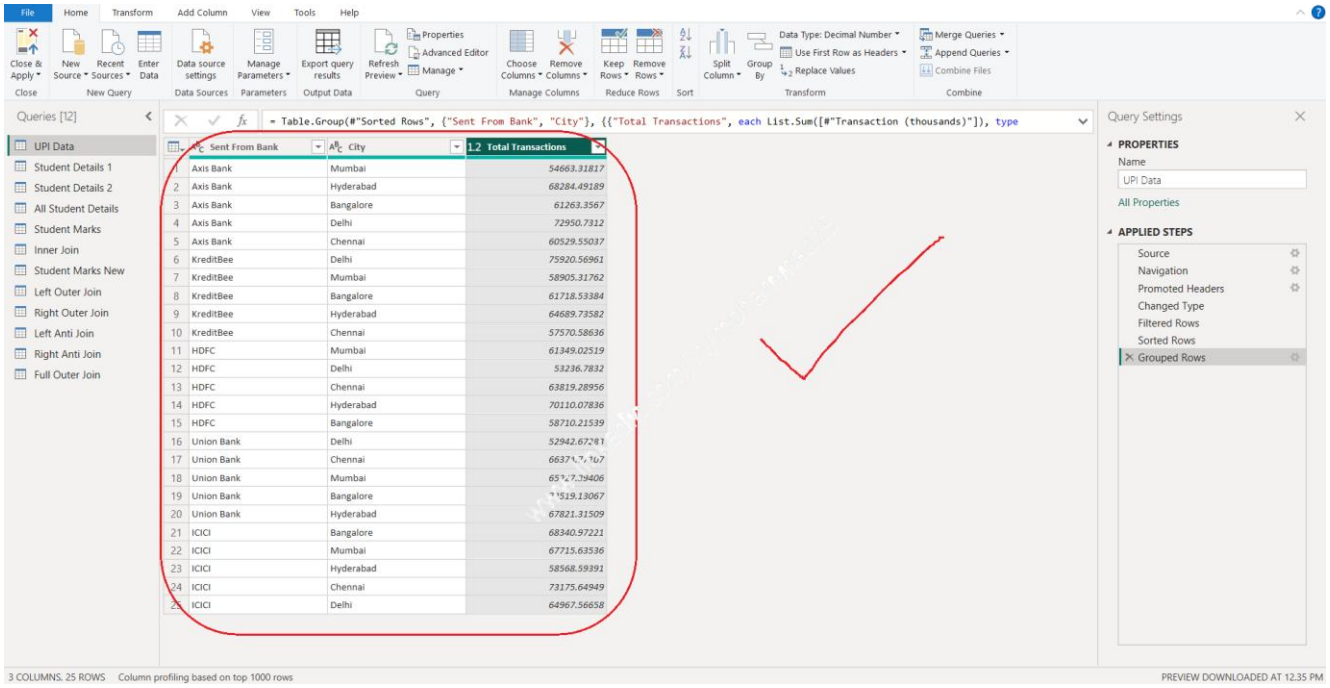


ii. GROUB By on the basis of more than one column

Q. Find out the total transactions from each bank in each City.



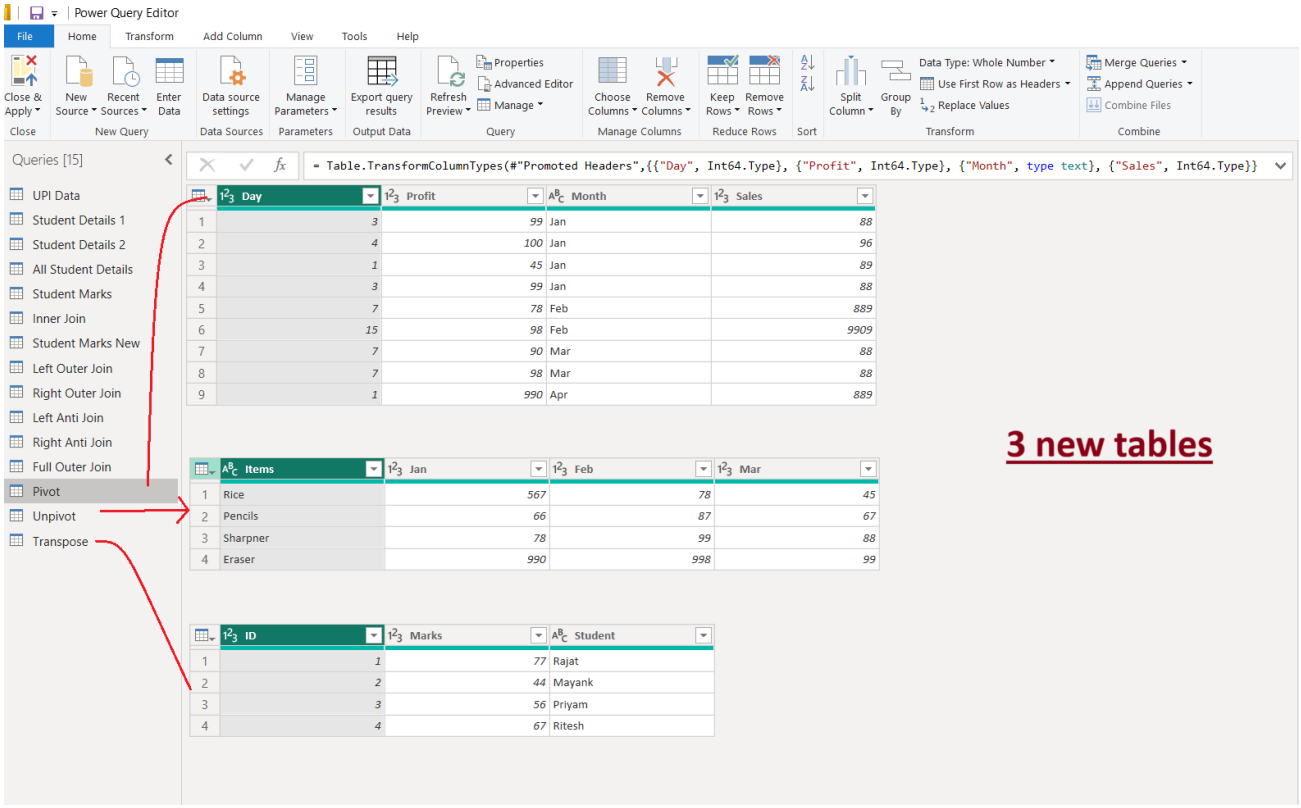
RESULT:


= Table.Group(#"Sorted Rows", {"Sent From Bank", "City"}, {{"Total Transactions", each List.Sum([#"Transaction (thousands)"]), type
Queries [12]
UPI Data
Student Details 1
Student Details 2
All Student Details
Student Marks
Inner Join
Student Marks New
Left Outer Join
Right Outer Join
Left Anti Join
Right Anti Join
Full Outer Join
Sent From Bank
City
Total Transactions
Query Settings
PROPERTIES
Name
UPI Data
All Properties
APPLIED STEPS
Source
Navigation
Promoted Headers
Changed Type
Filtered Rows
Sorted Rows
Grouped Rows
3 COLUMNS, 25 ROWS
Column profiling based on top 1000 rows
PREVIEW DOWNLOADED AT 12:35 PM

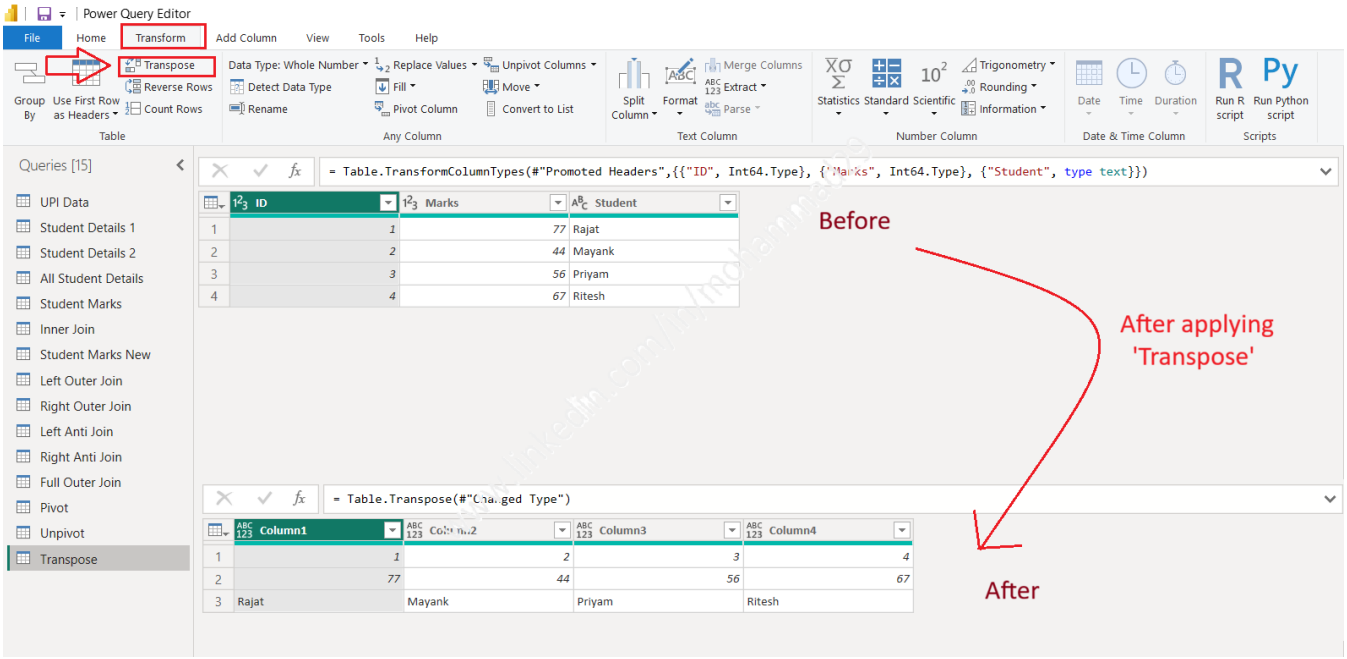
2.5. Transpose, Pivot & Unpivot in Power Query Editor

I have uploaded 3 new csv files:

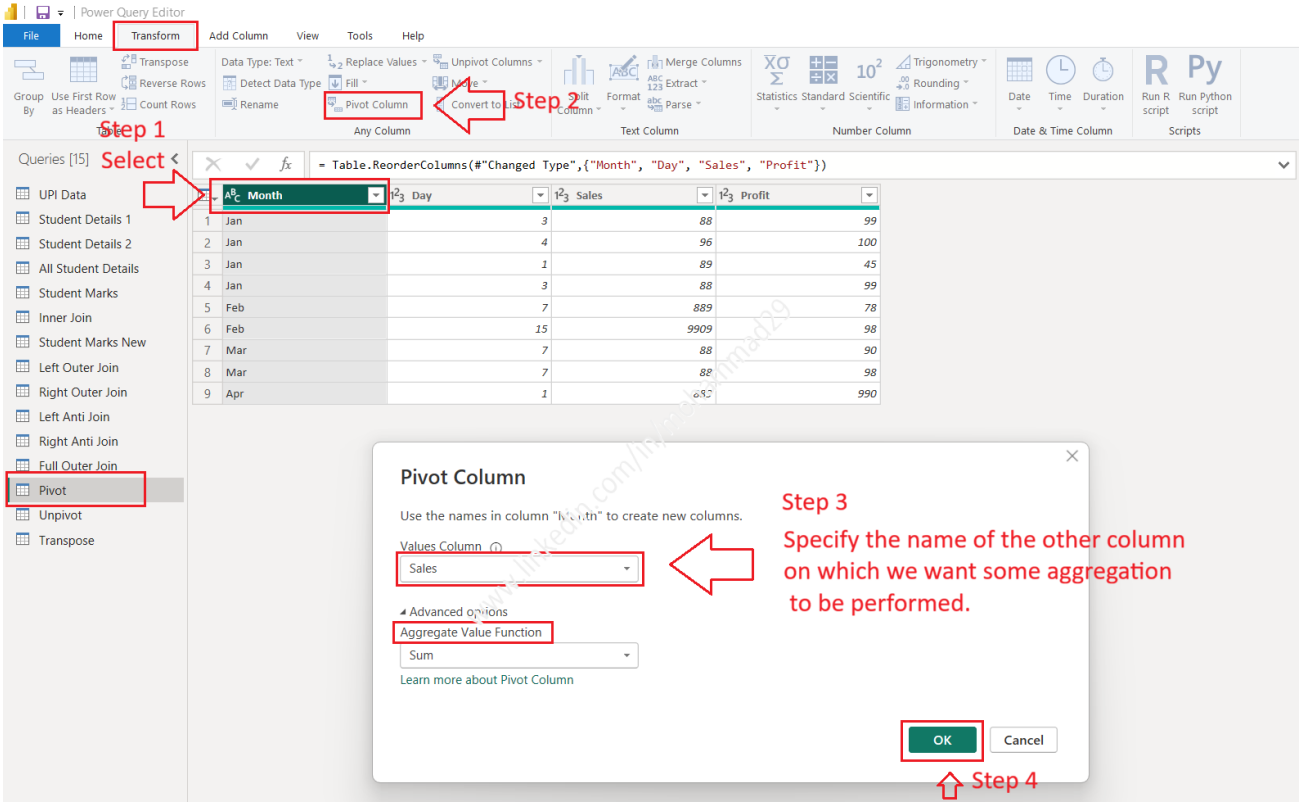
i. Pivot
ii. Unpivot
iii. Transpose

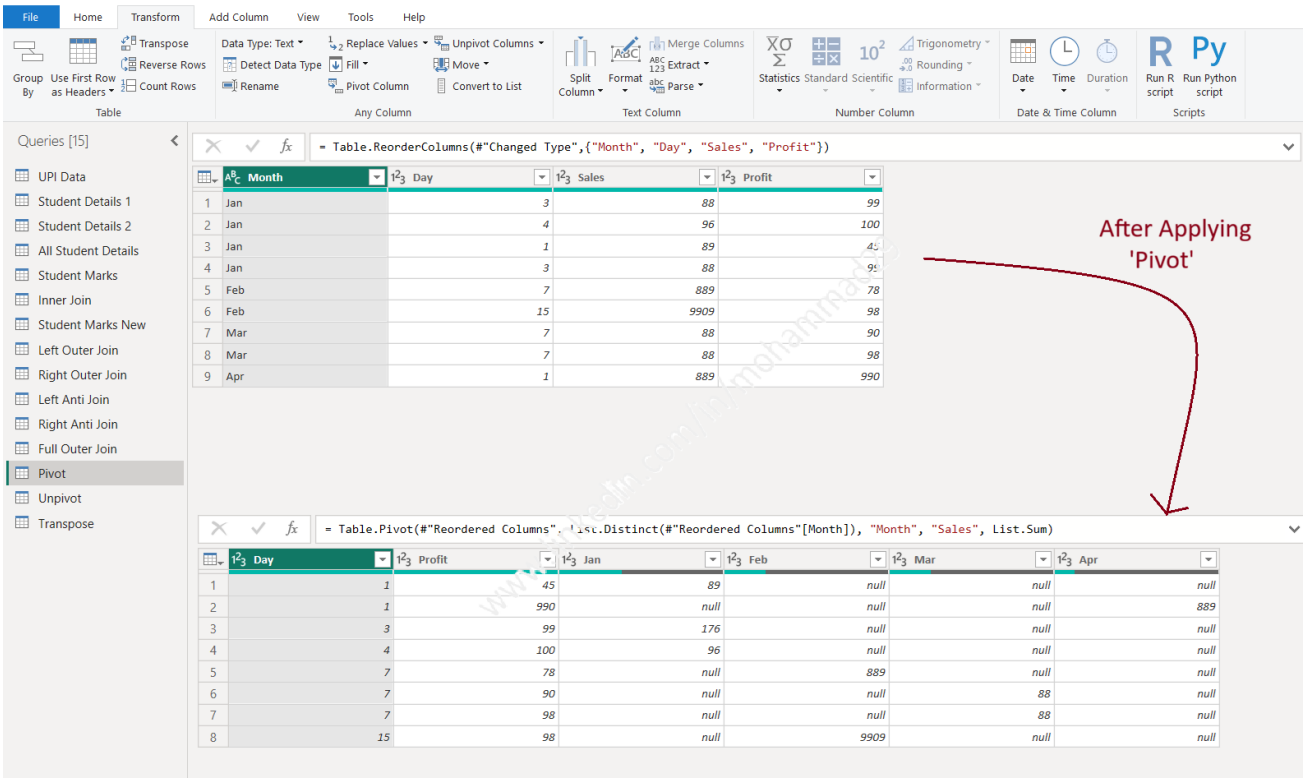


i. Transpose

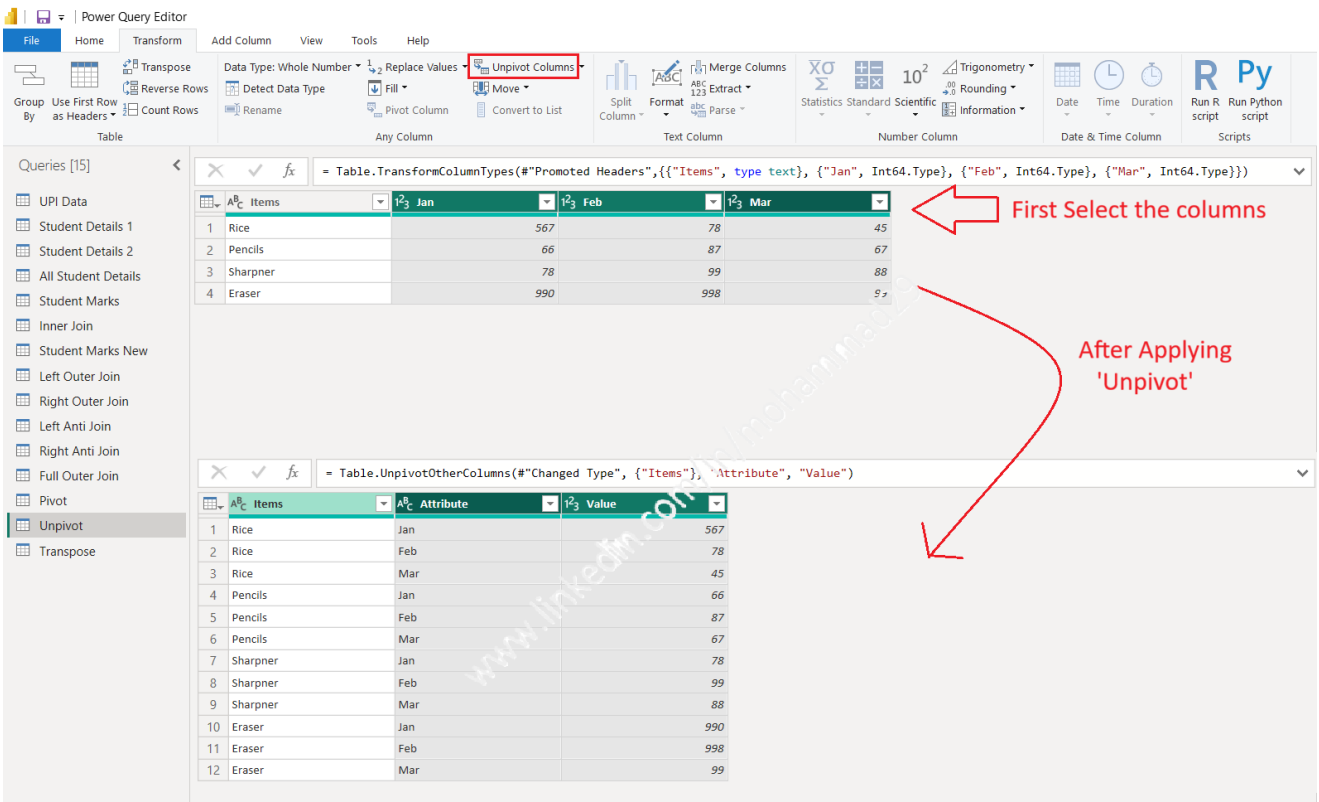


ii. Pivote



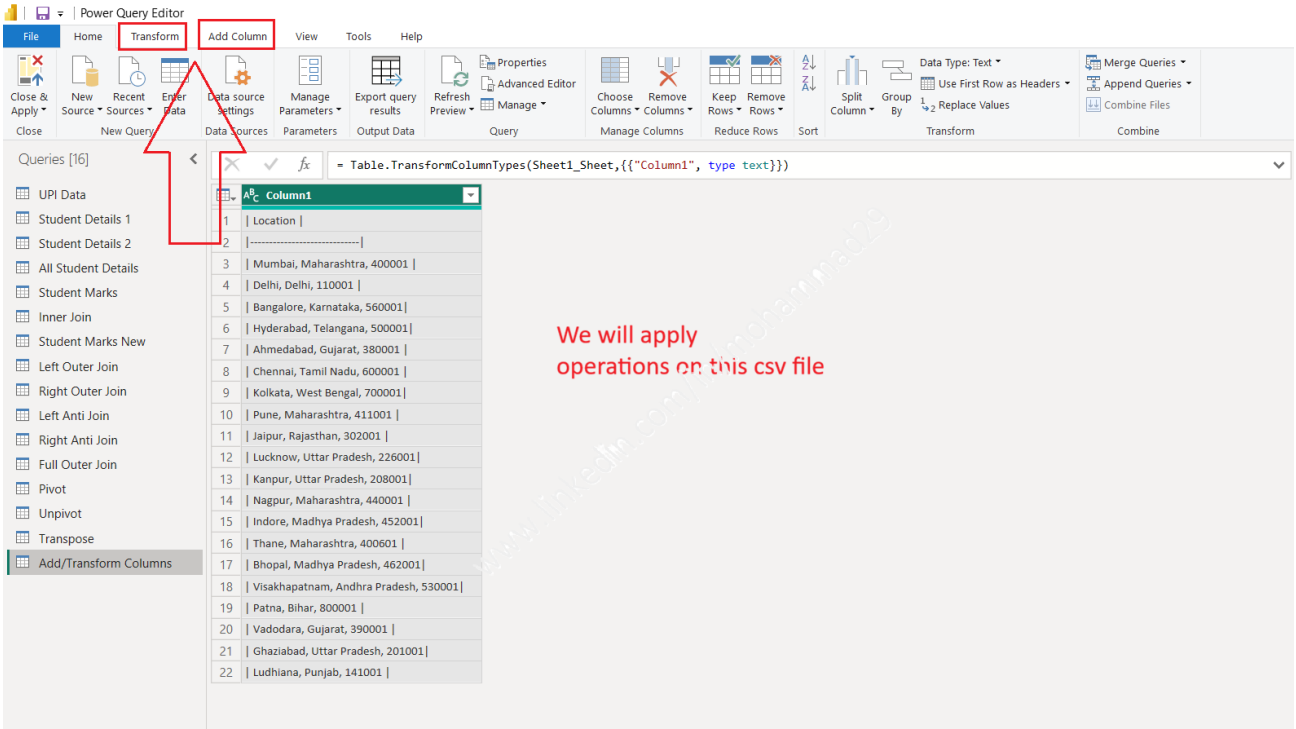

= Table.ReorderColumns(#"Changed Type",{"Month", "Day", "Sales", "Profit"})
= Table.Pivot(#"Reordered Columns", List.Distinct(#"Reordered Columns"[Month]), "Month", "Sales", List.Sum)
After Applying 'Pivot'

iii. Unpivot

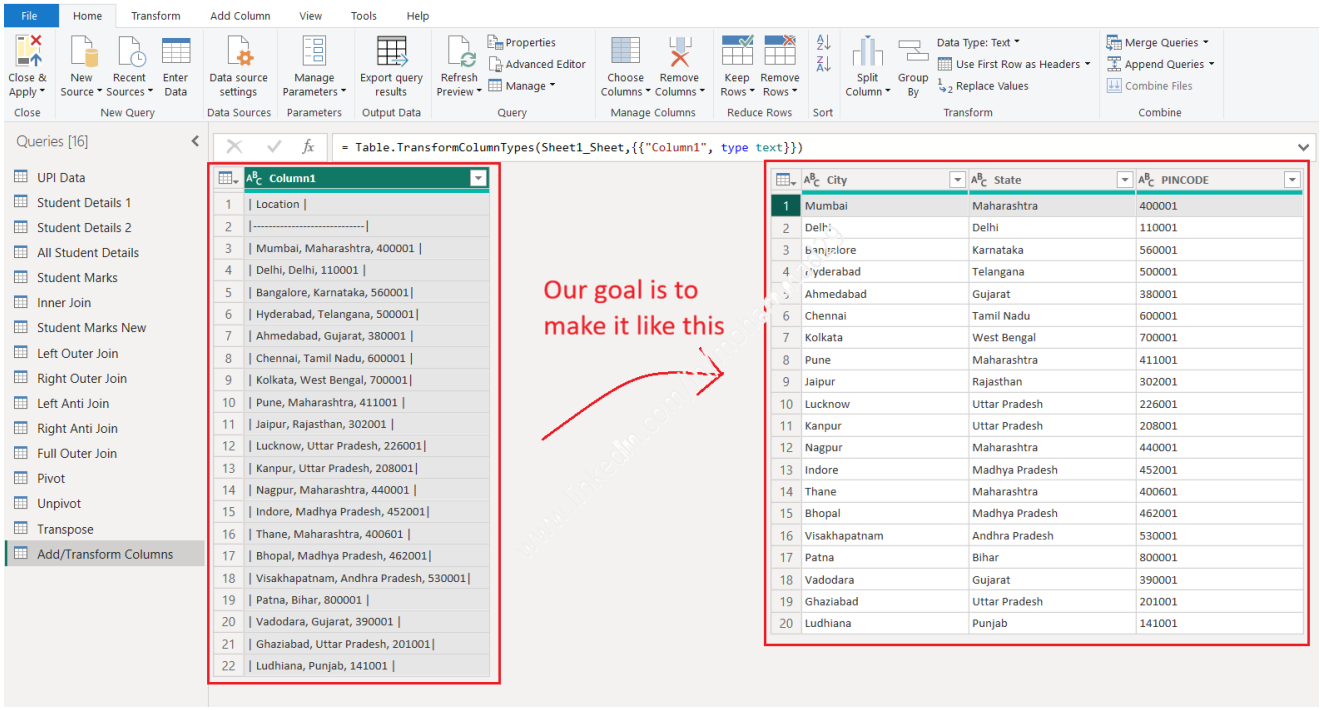

= Table.TransformColumnTypes(#"Promoted Headers",{{"Items", type text}, {"Jan", Int64.Type}, {"Feb", Int64.Type}, {"Mar", Int64.Type}})
= Table.UnpivotOtherColumns(#"Changed Type", {"Items"}, "Attribute", "Value")
First Select the columns
After Applying 'Unpivot'

2.6. Add/Transform tab in Power Query Editor

We have uploaded a new CSV file, and we will apply 'Transform & Add' operations on it.

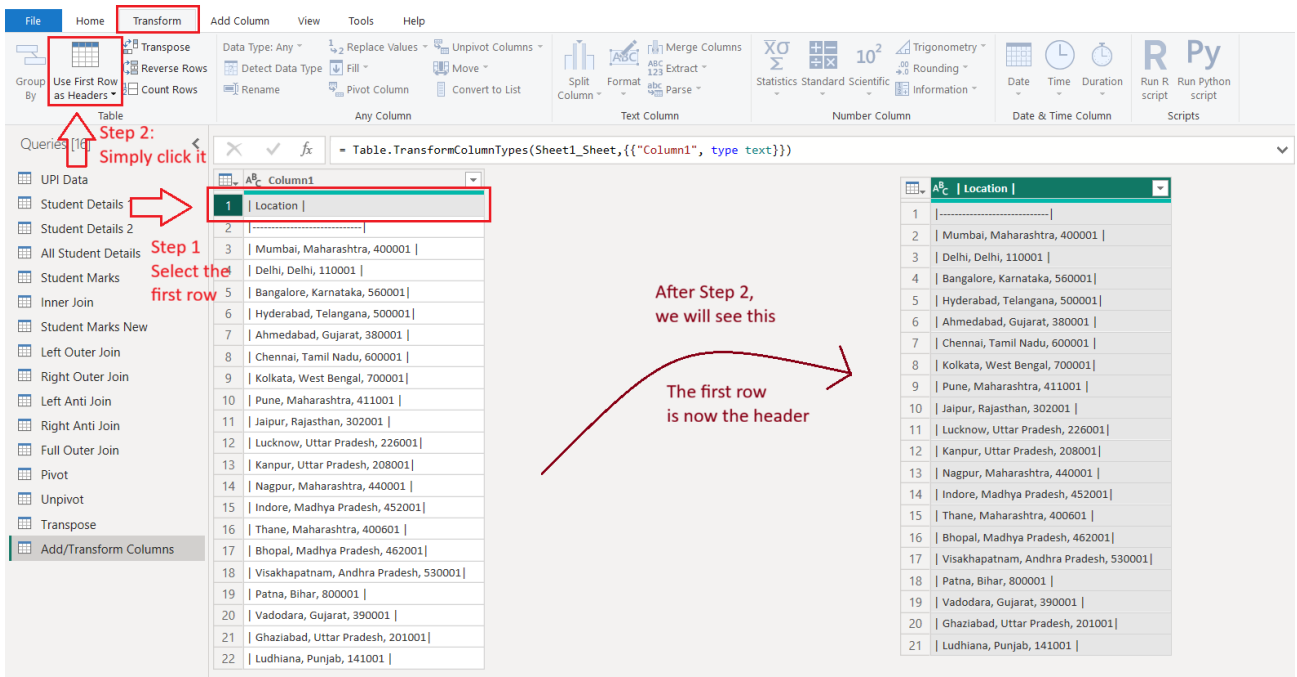


GOAL

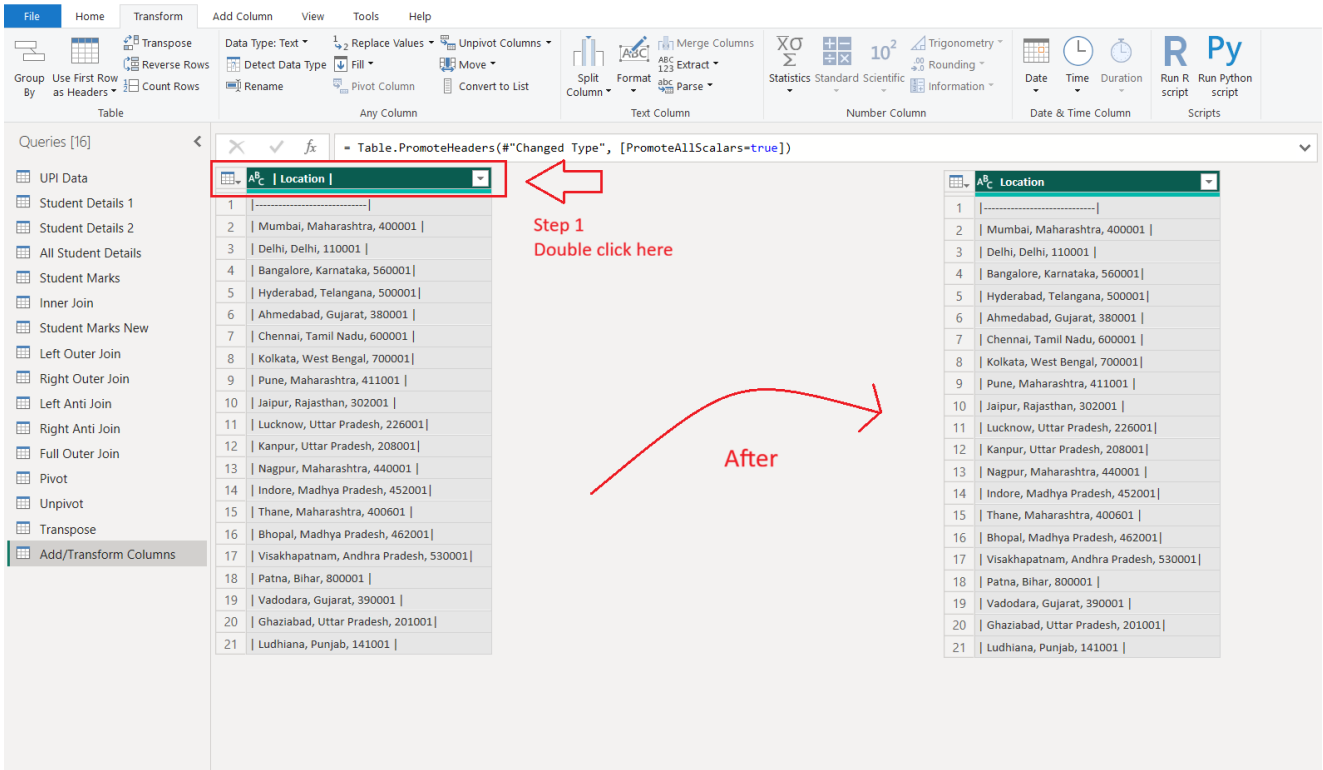


Q. Use the first row as header and modify the name.

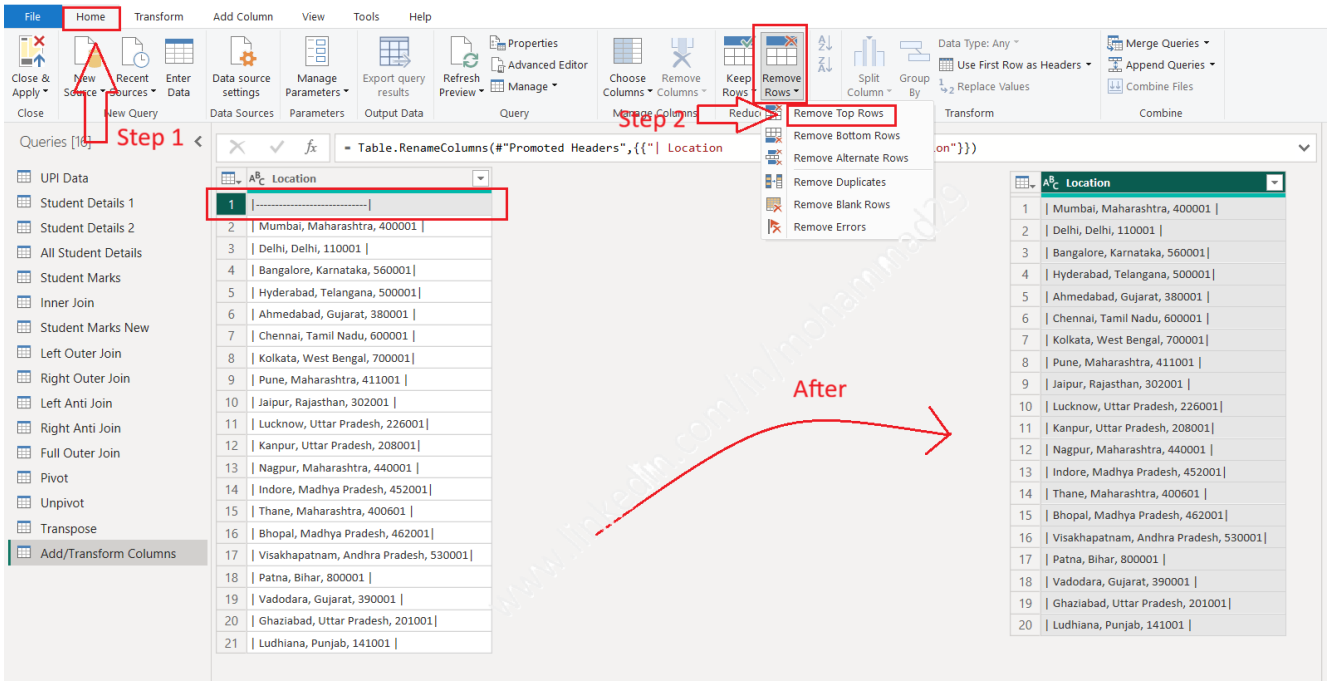
Step 1: Make the first row as header



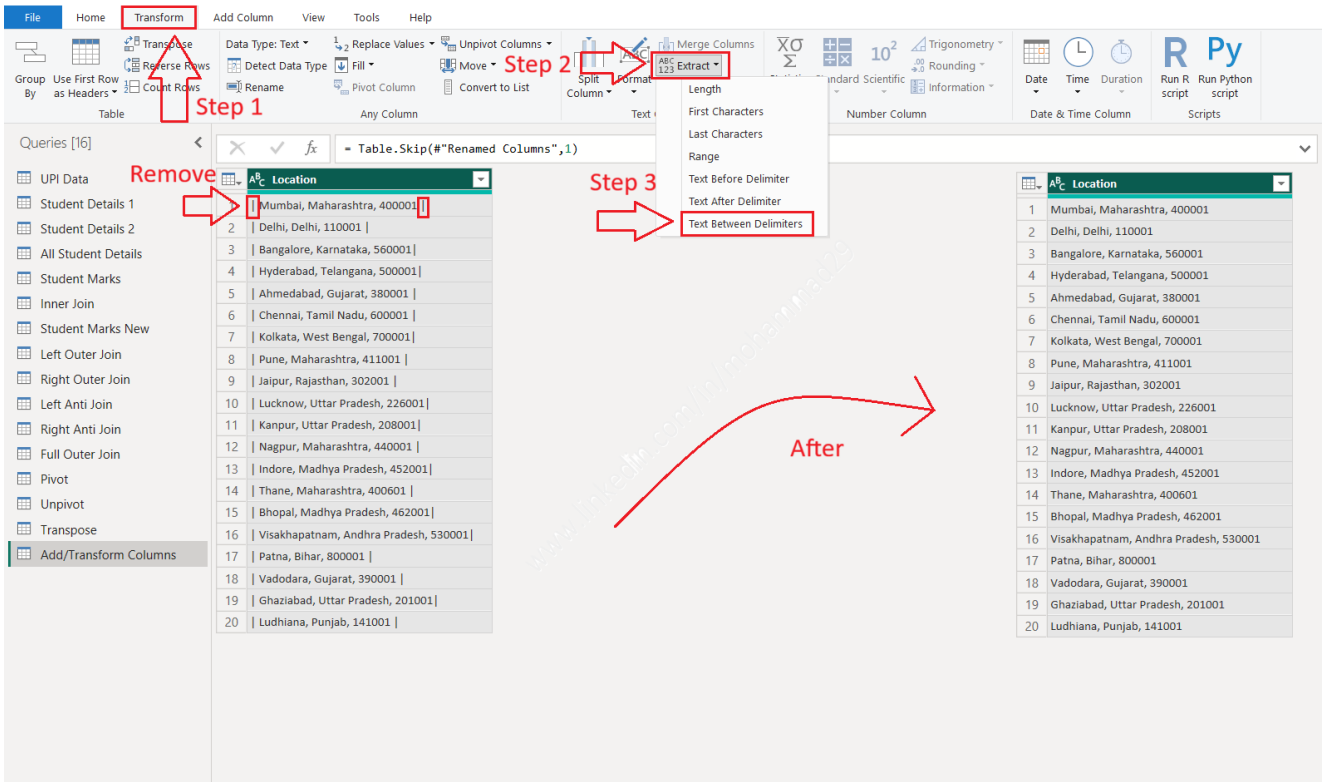
Step 2: Modify the name of the Header



Q. Remove the Top row

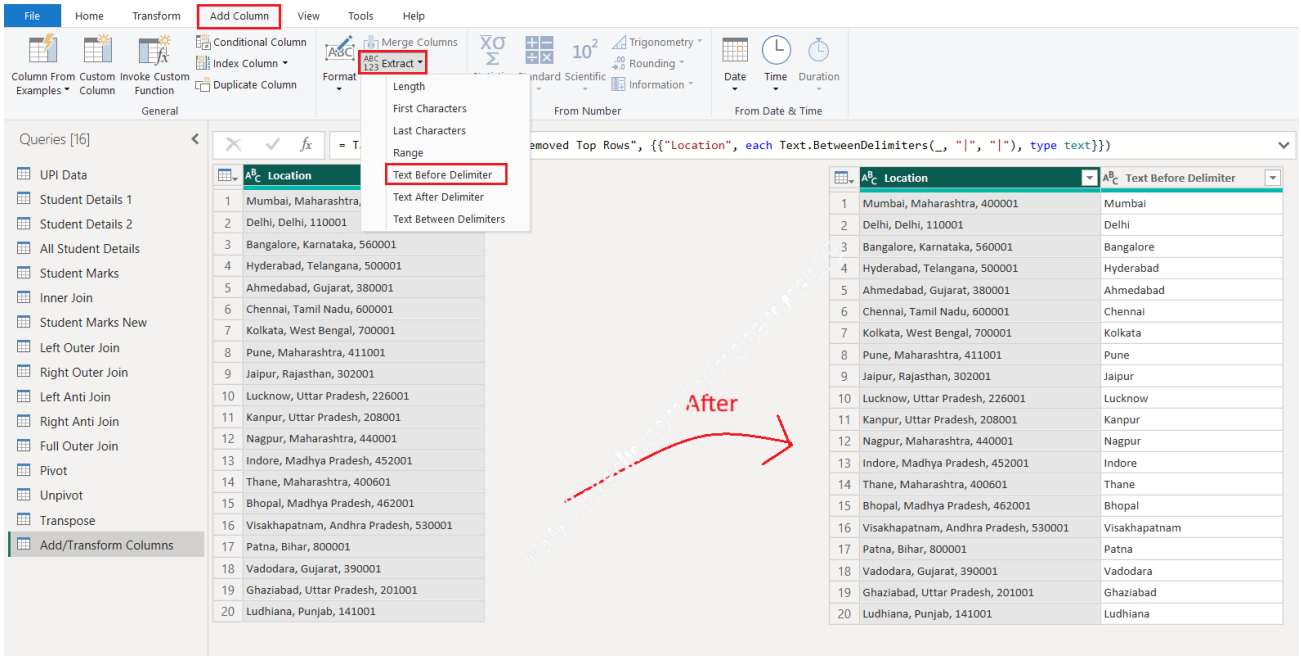


Q. Remove the '|' operator

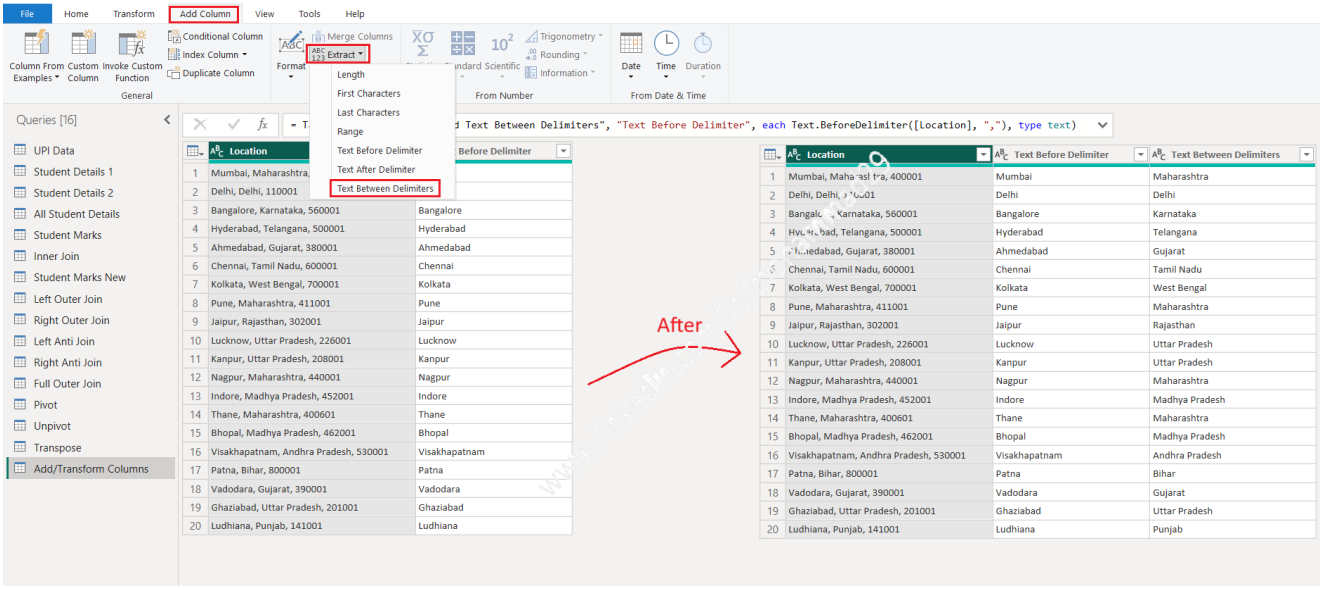


Q. Add three different columns

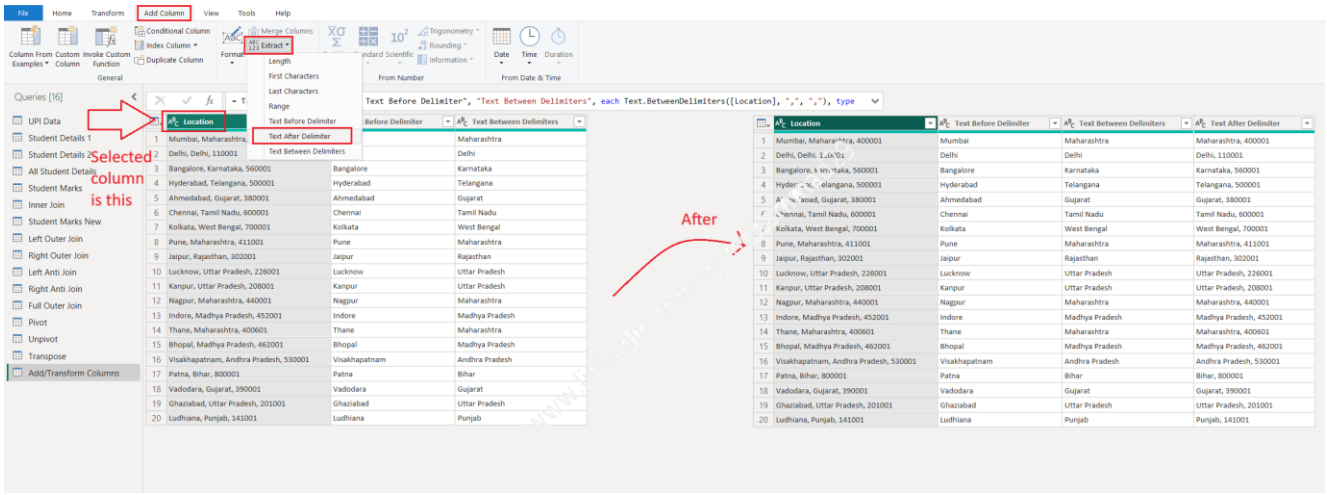
Step 1: First adding 1 column i.e City



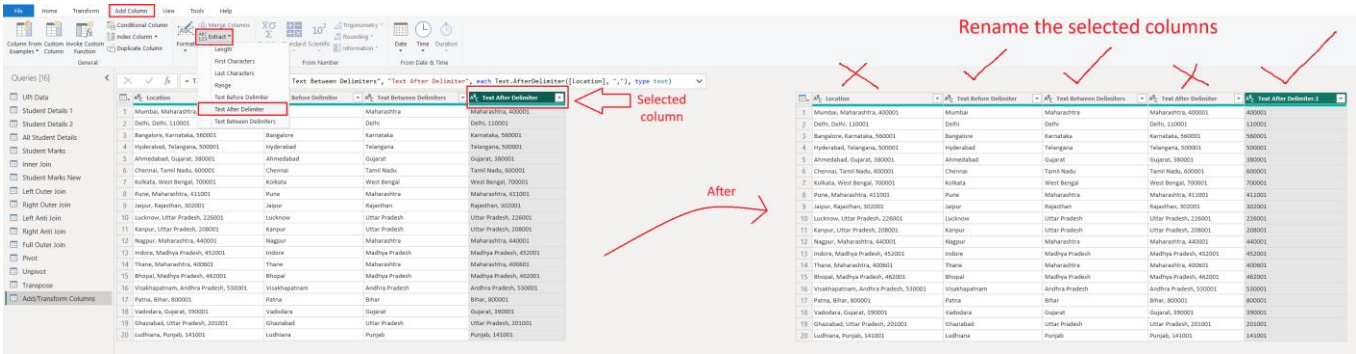
Step 2: Adding 2 column i.e State



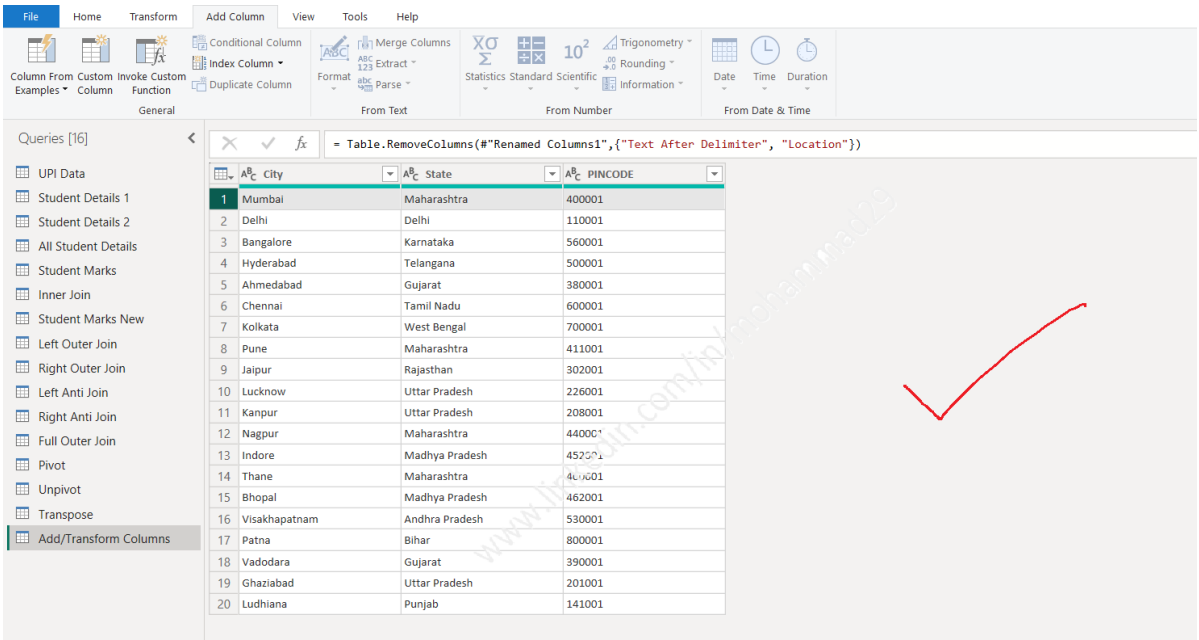
Step 3: Adding the thrid column is tricky i.e pincode



Further divide the 'Text After Delimeter'column



The final table looks like this



	City	State	PINCODE
1	Mumbai	Maharashtra	400001
2	Delhi	Delhi	110001
3	Bangalore	Karnataka	560001
4	Hyderabad	Telangana	500001
5	Ahmedabad	Gujarat	380001
6	Chennai	Tamil Nadu	600001
7	Kolkata	West Bengal	700001
8	Pune	Maharashtra	411001
9	Jaipur	Rajasthan	302001
10	Lucknow	Uttar Pradesh	226001
11	Kanpur	Uttar Pradesh	208001
12	Nagpur	Maharashtra	440001
13	Indore	Madhya Pradesh	452001
14	Thane	Maharashtra	400601
15	Bhopal	Madhya Pradesh	462001
16	Visakhapatnam	Andhra Pradesh	530001
17	Patna	Bihar	800001
18	Vadodara	Gujarat	390001
19	Ghaziabad	Uttar Pradesh	201001
20	Ludhiana	Punjab	141001