

UNIVERSITÀ DEGLI STUDI DI BERGAMO

Dipartimento di Ingegneria Gestionale, dell'Informazione e della Produzione

22059 – APPLIED TOPICS IN MANAGEMENT ENGINEERING

Excel, Access and Matlab

Prof. Giuseppe Pellegrini Prof. Renato Redondi

AGENDA

Lecture X

- RELATIONSHIPS BETWEEN TABLES
 - Inner join
 - Example
 - Left join
 - Example
 - Right join
 - Complex example
- FURTHER MATERIAL





• You often need to add information from one table to another table in order to have a single table containing all the information.

How to do it? You may use a JOIN.

- There are different types of join. We will focus on:
 - Inner join
 - Left join → It includes all of the rows from the table on the left and only those records from the table on the right that match the join field in the left table.
 - Right join → It includes all of the rows from the table on the right and only those rows from the table on the left that match the join field in the right table.





Inner join

- It includes rows in the query only when the joined field matches records in both tables.
- It the most common type of join.
- This type of join requires a comparison operator to match rows from the participating tables based on a common field or column of both the tables.
- Access automatically creates inner joins if you add two tables to a query.

```
SELECT table1.column1, table2.column2...
FROM table1
INNER JOIN table2
ON table1.common_field = table2.common_field;
```

Fig.1: Inner join Syntax





RELATIONSHIPS BETWEEN TABLES - Inner join

Example

You want to add the income bracket to each student in the database.

- To do this, you have to use two different tables:
 - 1. FASCIA REDDITO for the income bracket.
 - 2. DATABASE STUDENTI for the list of students.
- By imposing the join on the freshman, which is common to both tables, Access, for each freshman in the table containing the list of students, will search for the corresponding value in the "Fascia reddito" table.
- Through the query, the column in "Database studenti" table will be added to the "Fascia reddito" table.





RELATIONSHIPS BETWEEN TABLES - Inner join

Example

- Create a select query by following the known steps. ٠
- Then, right-click on the main screen. ۲
- Select "Show table". •
- The Show table window will appear. ٠
- Choose the "Fascia reddito" table. ۲
- The "Fascia reddito" table will appear near the "Database studenti" table. ٠

Mostra tabella	?	\times	Database studenti	Fascia reddito
TabelleQueryEntrambeDatabase studentiEconomics studentsEngineering studentsFascia redditoRata per FasciaStudenti selezionati			* MATRICOLA COGNOME NOME DIPARTIMENTO	* MATRICOLA FASCIA REDDITO
Fig.2 : Show table window	N		Fig. 3: Visua	lization of the two tables

Fig.3: Visualization of the two tables





- Inner join

Example

• To create the inner join, click on Freshman heading of the "Database studenti" table and drag it onto the Freshman heading of the "Fascia reddito" table.

- If you right-click on the line representing the inner join, you can select "Join properties".
- The Join properties window will appear.
- You can choose: <u>1</u>. Inner join
 - 2. Left join
 - 3. Right join



Fig.4: Inner join between the two tables

Proprietà join	? ×
Nome tabella sinistra	Nome tabella destra
Database studenti	Fascia reddito 🗸
Nome colonna sinistra	Nome colonna destra
MATRICOLA	MATRICOLA
• 1: Includi solo le righe in cui i campi e	collegati da entrambe le tabelle sono uguali.
2: Includi tutti i record di 'Database si cui i campi collegati sono uguali.	tudenti' e solo i record di 'Fascia reddito' in
3: Includi tutti i record di 'Fascia redd cui i campi collegati sono uguali.	ito' e solo i record di 'Database studenti' in
ОК Апт	nulla Nuovo

Fig.5: Join properties window



RELATIONSHIPS BETWEEN TABLES - Inner join

Example

- In the Query Builder you have to add the "Fascia reddito" column by writing "Fascia reddito" in the "Field" row.
- Automatically, in the "Table" row will appear Fascia reddito.
- Check the show box under "Fascia reddito" column.

[MATRICOLA]	[COGNOME]	[NOME]	[DIPARTIMENTO]	FASCIA REDDITO	
Database studenti	Database studenti	Database studenti	Database studenti	Fascia reddito	
\checkmark	\checkmark	\checkmark	\checkmark		
[MATRICOLA] Database studenti	MATRICOLA] [COGNOME] Database studenti	MATRICOLA] [COGNOME] [NOME] Database studenti Database studenti Database studenti	MATRICOLA] [COGNOME] [NOME] [DIPARTIMENTO] Database studenti Database studenti Database studenti Database studenti	MATRICOLA] [COGNOME] [NOME] [DIPARTIMENTO] FASCIA REDDITO Database studenti Database studenti Database studenti Fascia reddito Image: Comparison of the studenti Database studenti Image: Comparison of the studenti Fascia reddito Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the studenti Image: Comparison of the stude

Fig.6: Query Builder

• Now, click on Run.



RELATIONSHIPS BETWEEN TABLES - Inner join

Example

• The "Database studenti" query will open.



	Database studen	nti Query7 $ imes$					
	MATRICOLA -	COGNOME	Ŧ	NOME -	DIPARTIMEN 🔨	FASCIA REDE	-
	2035057	RUGGIERO		LUISA	LINGUE	E	
	2035056	MARTINI		MARISA	INGEGNERIA	A	
	2035055	FERRETTI		NICHOLAS	GIURISPRUDEN	D	
	2035054	BIANCO		GRETA	GIURISPRUDEN	F	
	2035053	GALLO		ELIANA	INGEGNERIA	В	
	2035052	SILVESTRI		LUCIANA	INGEGNERIA	G	
	2035051	LOMBARDO		CAROLINA	GIURISPRUDEN	G	
	2035050	RINALDI		RAFFAELE	GIURISPRUDEN	E	
	2035049	BARBIERI		EMANUELA	ECONOMIA	A	
	2035048	VALENTE		MIHAELA	GIURISPRUDEN	F	
	2035047	MESSINA		IRENE	LINGUE	E	
	2035046	GALLO		DINO	INGEGNERIA	F	
	2035045	PELLEGRINO		MILENA	GIURISPRUDEN	Α	

Fig.7: Inner join in "Database studenti" quey

The «Fascia reddito» column has been added to «Database studenti» table.

NB.

For each frashman in «Database studenti» table the corresponding income bracket in the «Fascia reddito» table has been found.



Left join

- It returns all rows from the left table, even if there are no matches in the right table.
- This means that a left join returns all the values from the left table, plus matched values from the right table or NULL in case of no matching join predicate.

```
SELECT table1.column1, table2.column2...
FROM table1
LEFT JOIN table2
ON table1.common_field = table2.common_field;
```

Fig.8: Left join Syntax



RELATIONSHIPS BETWEEN TABLES - Left join

Example

You want to add to the students' database a column to indicate who has already paid the installment.

- To do this, you have to use two different tables:
 - 1. DATABASE STUDENTI, for the list of students.
 - 2. PAGATO, for the list of students who have already paid.
- By imposing the left join on the freshman and the last name, which are common to both tables, Access will report all fields of the "Database studenti" table and only records of the "Pagato" table where the linked fields are the same.



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RELATIONSHIPS BETWEEN TABLES - Left join

Example

- Create a select query by following the known steps.
- Then, right-click on the main screen.
- Select "Show table".
- The Show table window will appear.
- Choose the "Pagato" table.
- The "Pagato" table will appear near the "Database studenti" table.

Mostra tabella ? ×	Database studenti	Pagato
Tabelle Query Entrambe	*	*
Database con fascia reddito Database studenti Economics students Engineering students Eascia reddito	MATRICOLA COGNOME NOME	MATRICOLA COGNOME PAGAMENTO
Pagato Rata per Fascia Studenti selezionati	DIPARTIMENTO	

Fig.9: Show table window







- Left join

Example

- To create the left join, click on Freshman heading of the "Database studenti" table and drag it onto the Freshman heading of the "Pagato" table.
- Do the same for Last name heading.
- If you right-click on the line representing the left join, you can select "Join properties".
- The Join properties window will appear.
- You have to choose the "left join" option represented by the option 2 for both the lines.



Fig.11: Left join between the two tables

Proprietà join	? ×
Nome tabella sinistra Nom	e tabella destra
Database studenti 🗸 Paga	to 🗸
Nome colonna sinistra Nom	e colonna destra
MATRICOLA MAT	RICOLA
1: Includi solo le righe in cui i campi collega	ti da entrambe le tabelle sono uguali.
2: Includi tutti i record di 'Database studenti campi collegati sono uguali.	e solo i record di 'Pagato' in cui i
3: Includi tutti i record di 'Pagato' e solo i recompi collegati sono uguali.	cord di 'Database studenti' in cui i
OK Annulla	Nuovo

Fig.12: Join properties window



RELATIONSHIPS BETWEEN TABLES - Left join

Example

- In the Query Builder you have to add the "Pagamento" column by double clicking on the field "Pagamento" in "Pagato" table.
- Automatically, in the "Table" row will appear Pagato.

Campo:	[MATRICOLA]	[COGNOME]	[NOME]	[DIPARTIMENTO]	PAGAMENTO 🗠
Tabella:	Database studenti	Database studenti	Database studenti	Database studenti	Pagato
Ordinamento:					
Mostra:	\checkmark	\checkmark	\checkmark	\checkmark	
Criteri:					
Oppure:					
I					

Fig.13: Query Builder

• Now, click on Run.





RELATIONSHIPS BETWEEN TABLES - Left join

Example

• The query result will open.

MATRICOLA -	COGNOME -	NOME -	DIPARTIMEN	PAGAMENTO 🗩
2034512	BIANCHI	CLARA	GIURISPRUDEN	1
2034513	FRANCO	CORRADO	GIURISPRUDEN	
2034514	FERRARO	ALBERTO	ECONOMIA	
2034515	LONGO	REBECCA	LINGUE	
2034516	GALLI	MANLIO	ECONOMIA	1
2034517	LEONE	DORIANA	ECONOMIA	
2034518	BASILE	GIOVANNA	LETTERE	
2034519	FERRARA	DANIELE	ECONOMIA	
2034520	SORRENTINO	FULVIO	GIURISPRUDEN	
2034521	PELLEGRINO	ANITA	ECONOMIA	
2034522	VITALE	NADIA	ECONOMIA	1

Fig.14: Left join result



The «Pagamento» column has been added to «Database studenti» table.

NB.

For each frashman and related last name in «Database studenti» table that has correspondence within the «Pagato» table, Access will add a 1 in the Pagamento column.



Right join

- It returns all rows from the right table, even if there are no matches in the left table.
- This means that a right join returns all the values from the right table, plus matched values from the left table or NULL in case of no matching join predicate.

```
SELECT table1.column1, table2.column2...
FROM table1
RIGHT JOIN table2
ON table1.common_field = table2.common_field;
```

Fig.15: Right join Syntax





Right join

- The result of a query which contains a right join is more or less the same of that of a query with a left join.
- The difference is that Access will report all the fields of the right table and only the records of the left table where the linked fields are the same.
- Therefore, the right join performs the same operation as the left join, but with inverted tables.





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Complex example

• Below has been carried out a more complex example in which three tables and two inner joins have been used.

You want to know how much money the university should raise from each individual department.

- Create a select query by following the known steps.
- Then, right-click on the main screen.
- Select "Show table".
- The Show table window will appear.





RELATIONSHIPS BETWEEN TABLES - Complex example

- Choose the "Fascia reddito" table. Then, click on add.
- The "Fascia reddito" table will appear near the "Database studenti" table.
- Choose the "Rata per fascia" table. Then, click on add.
- The "Rata per fascia" table will appear near the previous two.





Fig.16: Show table window





RELATIONSHIPS BETWEEN TABLES - Complex example

- Now, you will have to set up two inner joins.
- So, click on Freshman heading of the "Database studenti" table and drag it onto the Freshman heading of the "Fascia reddito" table.
- Click on Income brackets heading of the "Fascia reddito" table and drag it onto the Income brackets heading of the "Rata per fascia" table.
- Click on Department heading of the "Database student" table and drag it onto the Department heading of the "Rata per fascia" table.



Fig.17: Inner joins between the three tables.





RELATIONSHIPS BETWEEN TABLES - Complex example

- In the Query Builder impose the sum of the installments and the grouping of departments.
- Remove all the other fields.



Fig.18: Query Builder



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- Complex example

• The query result will open.

2	DIPARTIMEN -	SommaDiRA 👻				
	ECONOMIA	140.776,50€				
	GIURISPRUDEN	167.646,93 €				
	INGEGNERIA	233.993,09€				
	LETTERE	79.505,53€				
	LINGUE	96.015,13€				
	Fig.19: Complex example result					



- The query result shows, as requested, only two columns:
- 1. The column containing the departments.
- 2. The column containing the sum of the instalments for each department.



FURTHER MATERIAL

To review and deepen the topics of this lecture

A

- 1. <u>https://www.youtube.com/watch?v=L7xvL9eQ_tY</u>
- 2. https://www.youtube.com/watch?v=ZmoU_fkG7d8
- 3. Alexander, M., & Kusleika, R. (2018). Access 2019 Bible. John Wiley & Sons.



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