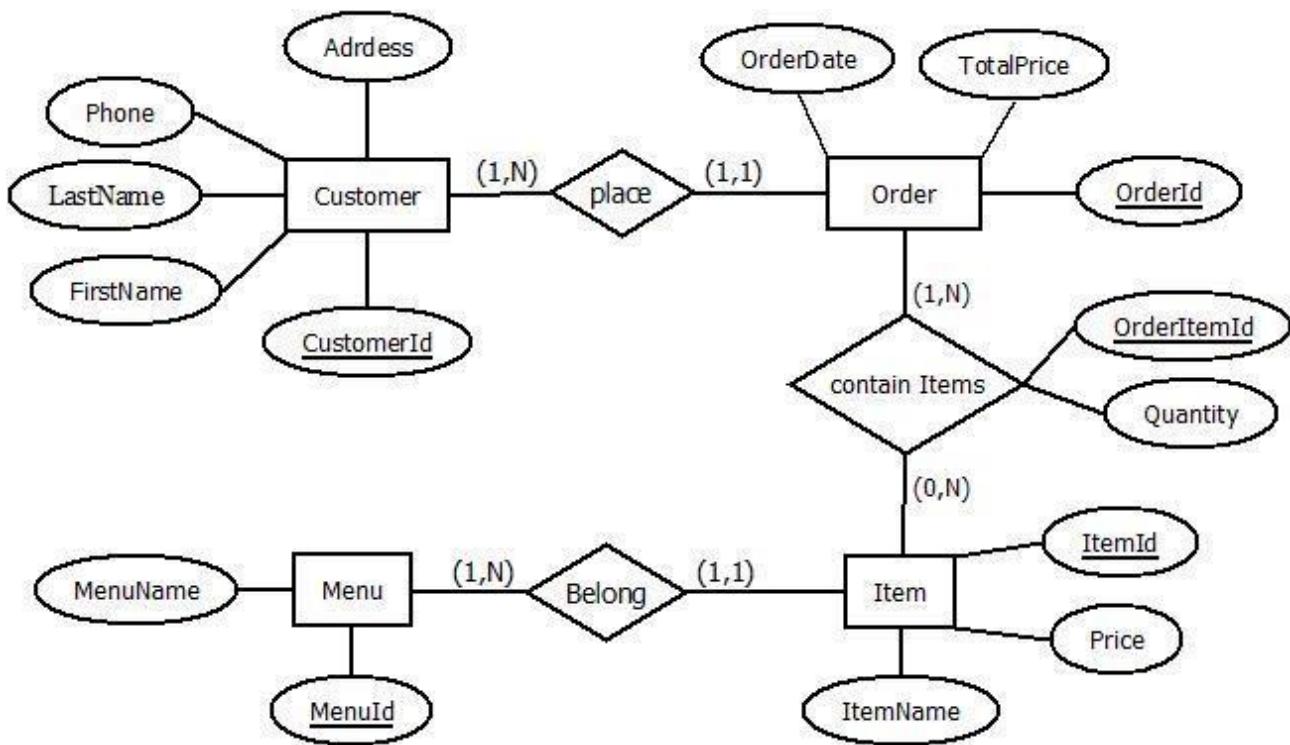


## Entity Relationship Diagram (ERD) for Restaurant



<b>Customer</b>				
<u>CustomerId</u>	FirstName	LastName	Phone	Address
1	Anthony	Al Najour	70147805	Beirut
2	Rita	Data	71245685	Batroun
3	Richard	Badran	71456985	Saida
4	David	Salloum	71854632	Tripoli

<b>Order</b>				
<u>OrderId</u>	CustomerId	OrderDate	TotalPrice	
1	1	20-03-24	85	
2	2	21-03-24	69	
3	3	22-03-23	121	
4	2	23-03-24	56	
5	4	24-03-23	95	
6	1	25-03-24	70	

<b>OrderItem</b>				
<u>OrderItemId</u>	OrderId	ItemId	Quantity	
1	1	1	1	
2	2	5	2	
3	3	2	1	
4	4	3	3	
5	5	4	1	
6	6	1	2	
7	2	1	1	

<b>Item</b>			
<u>ItemId</u>	ItemName	Price	MenuId
1	Burger	26	1
2	Pizza	19	1
3	Fries	7	2
4	Cake	10	3
5	Juice	4	4

<b>Menu</b>	
<u>MenuId</u>	MenuName
1	Main Course
2	Appetizers
3	Desserts
4	Beverages

## Relational Algebra Operations

- **Select operation with multiple conditions in one statement:**

- **Question:** Retrieve all items with a price greater than \$10 and belong to the "Main course" Menu.

**MENU\_ITM**  $\leftarrow (Item \bowtie_{Item.MenuId = Menu.MenuId} Menu)$

**R**  $\leftarrow \sigma_{(Price > 10 \text{ AND } MenuName = 'Main Course')} (\textbf{MENU\_ITM})$

**R**

ItemId	ItemName	Price	MenuId	MenuId	MenuName
1	Burger	26	1	1	Main Course
2	Pizza	19	1	1	Main Course

- **2 different statements of containing project operation + select operations:**

- **Question 1:** Get the first and last name, total price of customers who made orders with a total price greater than \$85

**CUST\_ORD**  $\leftarrow (Customer \bowtie_{Customer.CustomerId = Order.CustomerId} Order)$

**R**  $\leftarrow \pi_{(FirstName, LastName, TotalPrice)} (\sigma_{(TotalPrice >= 85)} (\textbf{CUST_ORD}))$

FirstName	LastName	TotalPrice
Anthony	Al Najour	85
Richard	Badran	121
David	Salloum	95

- **Question 2:** Display the name and price of items with a price greater than 18

**R**  $\leftarrow \pi_{(ItemName, Price)} (\sigma_{(Price > 18)} (\textbf{Item}))$

ItemName	Price
Burger	26
Pizza	19

- **2 join + select operation in one statement:**

- **Question:** Retrieve the names of customers who placed an order contain "Pizza" item.

$$\begin{aligned}
 \text{CUST\_ORD} &\leftarrow (\text{Customer} \bowtie \text{Order} \mid\mid \text{Customer.CustomerId} = \text{Order.CustomerId}) \text{ Order} \\
 \text{ORD\_ITM} &\leftarrow (\text{OrderItem} \bowtie \text{Item} \mid\mid \text{OrderItem.OrderId} = \text{CUST\_ORD.OrderId}) \text{ CUST\_ORD} \\
 \text{CUST\_ITM} &\leftarrow (\text{Item} \bowtie \text{Item} \mid\mid \text{Item.ItemId} = \text{ORD\_ITM.ItemId}) \text{ ORD\_ITM} \\
 \text{CUST\_PIZZA} &\leftarrow \sigma(\text{ItemName} = \text{'Pizza'}) \text{ CUST\_ITM} \\
 \text{R} &\leftarrow \pi_{(\text{FirstName}, \text{LastName})} (\text{CUST\_PIZZA})
 \end{aligned}$$

FirstName	LastName
Richard	Badran

- **2 different statements of union operation:**

- **Question1:** Combine the all order details placed by phone numbers "71245685" and "71854632".

$$\begin{aligned}
 \text{CUST\_ORD} &\leftarrow (\text{Customer} \bowtie \text{Order} \mid\mid \text{Customer.CustomerId} = \text{Order.CustomerId}) \text{ Order} \\
 \text{CUST1} &\leftarrow \pi_{(\text{FirstName}, \text{LastName}, \text{OrderDate}, \text{TotalPrice})} (\sigma(\text{Phone} = \text{'71245685'})) \text{ (CUST\_ORD)} \\
 \text{CUST2} &\leftarrow \pi_{(\text{FirstName}, \text{LastName}, \text{OrderDate}, \text{TotalPrice})} (\sigma(\text{Phone} = \text{'71854632'})) \text{ (CUST\_ORD)} \\
 \text{R} &\leftarrow \text{CUST1} \cup \text{CUST2}
 \end{aligned}$$

FirstName	LastName	OrderDate	TotalPrice
David	Salloum	24-03-23	95
Rita	Data	21-03-24	69
Rita	Data	23-03-24	56

- **Question2:** Get All items (ItemName, MenuName) in "Appetizers" and "Desserts" menus.

$$\begin{aligned}
 \text{MENU\_ITM} &\leftarrow (\text{Item} \bowtie \text{Menu} \mid\mid \text{Item.MenuId} = \text{Menu.MenuId}) \text{ Menu} \\
 \text{ITM\_APP} &\leftarrow \pi_{(\text{ItemName}, \text{MenuName})} (\sigma(\text{MenuName} = \text{'Appetizers'})) \text{ (MENU\_ITM)} \\
 \text{ITM\_DES} &\leftarrow \pi_{(\text{ItemName}, \text{MenuName})} (\sigma(\text{MenuName} = \text{'Desserts'})) \text{ (MENU\_ITM)} \\
 \text{R} &\leftarrow \text{ITM\_APP} \cup \text{ITM\_DES}
 \end{aligned}$$

ItemName	MenuName
Cake	Desserts
Fries	Appetizers

- **2 different statements of intersection operation:**

- **Question1:** Find common item name placed by customers Address "Batroun" and "Beirut".

**CUST\_ORD**  $\leftarrow$  (Customer  $\bowtie$  Customer.CustomerId = Order.CustomerId **Order**)

**ORD**  $\leftarrow$  (OrderItem  $\bowtie$  OrderItem.OrderId = CUST\_ORD.OrderId **CUST\_ORD**)

**ORD\_ITM**  $\leftarrow$  (Item  $\bowtie$  Item.ItemId = ORD.OrderId **ORD**)

**ITM\_BAT**  $\leftarrow \pi_{(ItemName)}(\sigma_{(Address = 'Batroun')}(**ORD_ITM**))$

**ITM\_BEI**  $\leftarrow \pi_{(ItemName)}(\sigma_{(Address = 'Beirut')}(**ORD_ITM**))$

**R**  $\leftarrow$  **ITM\_BAT**  $\cap$  **ITM\_BEI**

ItemName
Burger

- **Question2:** Retrieve the common name of item that were ordered both in the "Appetizers" menu and by customers with addresses Batroun.

**CUST\_ORD**  $\leftarrow$  (Customer  $\bowtie$  Customer.CustomerId = Order.CustomerId **Order**)

**BAT\_ORD**  $\leftarrow \pi_{(OrderId)}(\sigma_{(Address = 'Batroun')}(**CUST_ORD**))$

**ORD\_ITM**  $\leftarrow$  (OrderItem  $\bowtie$  ItemOrder.OrderId = BAT\_ORD.OrderId **BAT\_ORD**)

**ITM\_BAT**  $\leftarrow \pi_{(ItemName)}(Item \bowtie Item.ItemId = ORD_ITM.ItemId **ORD_ITM**)$

**MENU\_ITM**  $\leftarrow$  (Item  $\bowtie$  Item.MenuId = Menu.MenuId **Menu**)

**MENU\_ITM\_APP**  $\leftarrow \sigma_{(MenuName = 'Appetizers')}(**MENU_ITM**)$

**ITM\_APP**  $\leftarrow \pi_{(ItemName)}(**MENU_ITM_APP**)$

**R**  $\leftarrow$  **ITM\_BAT**  $\cap$  **ITM\_APP**

ItemName
Fries

- **minus + select operations in one statement:**

- **Question:** Retrieve the name of items from the "Beverages" menu that have not been ordered by customers in "Beirut"

**CUST\_ORD**  $\leftarrow (\text{Customer} \bowtie_{\text{Customer.CustomerId} = \text{Order.CustomerId}} \text{Order})$

**BEI\_ORD**  $\leftarrow (\pi_{(\text{OrderId})}(\sigma_{(\text{Address} = \text{'Beirut'})} (\text{CUST_ORD}))$

**CUST\_ITM**  $\leftarrow (\text{OrderItem} \bowtie_{\text{ItemOrder.OrderId} = \text{BEI_ORD.OrderId}} \text{BEI_ORD})$

**ITEM\_BEI**  $\leftarrow \pi_{(\text{ItemName})}(\text{Item} \bowtie_{\text{Item.ItemId} = \text{CUST_ITM.ItemId}} \text{CUST_ITM})$

**MENU\_ITM**  $\leftarrow (\text{Item} \bowtie_{\text{Item.MenuId} = \text{Menu.MenuId}} \text{Menu})$

**MENU\_ITM\_BEV**  $\leftarrow \sigma_{(\text{MenuName} = \text{'Beverages'})} (\text{MENU_ITM})$

**ITEM\_BEV**  $\leftarrow \pi_{(\text{ItemName})}(\text{MENU_ITM_BEV})$

**R**  $\leftarrow \text{ITEM_BEV} - \text{ITEM_BEI}$

ItemName
Juice

- **select + union + project operations in one statement:**

- **Question:** Find the First and Last names of the customer who either address "batroun" or "Beirut"

**CUST\_BEI**  $\leftarrow \pi_{(\text{FirstName}, \text{LastName})}(\sigma_{(\text{Address} = \text{'Beirut'})} (\text{CUSTOMER}))$

**CUST\_BAT**  $\leftarrow \pi_{(\text{FirstName}, \text{LastName})}(\sigma_{(\text{Address} = \text{'Batroun'})} (\text{CUSTOMER}))$

**R**  $\leftarrow \text{CUST_BEI} \cup \text{CUST_BAT}$

FirstName	LastName
Anthony	Al Najour
Rita	Data

- **select + union + join +project operations in one statement:**

- **Question:** retrieve the names of customers who have either placed an order contain "Pizza" or "Burger."

**CUST\_ORD ← (Customer ⋈ Customer.CustomerId = Order.CustomerId Order)**

**ORD\_ITM ← (OrderItem ⋈ OrderItem.OrderId = CUST\_ORD.OrderId CUST\_ORD)**

**CUST\_ITM ← (Item ⋈ Item.ItemId = ORD\_ITM.ItemId ORD\_ITM)**

**CUST\_ORD\_PIZ ←  $\pi_{(\text{FirstName}, \text{LastName})}(\sigma_{(\text{ItemName} = \text{'Pizza'})} (\text{CUST_ITM}))$**

**CUST\_ORD\_BUR ←  $\pi_{(\text{FirstName}, \text{LastName})}(\sigma_{(\text{ItemName} = \text{'Burger'})} (\text{CUST_ITM}))$**

**R ← CUST\_ORD\_PIZ ∪ CUST\_ORD\_BUR**

FirstName	LastName
Anthony	Al Najour
Richard	Badran
Rita	Data

1) **SOL queries containing the below:**

- **Average , Having, Group by**

- **Question:** Retrieve the average total price of orders for customers who have placed more than one order.

```
SELECT c.CustomerId, c.FirstName, c.LastName, AVG(o.TotalPrice) AS
AvgerageTotalPrice
FROM Customer c
JOIN Order o on c.CustomerId = o.CustomerId
GROUP BY c.CustomerId, c.FirstName, c.LastName
HAVING COUNT (o.OrderId) > 1;
```

CustomerId	FirstName	LastName	AvgerageTotalPrice
1	Anthony	Al Najour	77.5
2	Rita	Data	62.5

- **Max , Having , Group by, where**

- **Question:** Find the CustomerId, FirstName, LastName, and maximum TotalPrice for customers who have placed more than one order after "2024-01-01".

```
SELECT c.CustomerId, c.FirstName, c.LastName, MAX(o.TotalPrice) AS MaximumTotalPrice
FROM Customer c
JOIN Order o on c.CustomerId = o.CustomerId
WHERE o.OrderDate > '2024-01-01'
GROUP BY c.CustomerId, c.FirstName, c.LastName
HAVING COUNT(o.OrderId) > 1;
```

CustomerId	FirstName	LastName	MaximumTotalPrice
1	Anthony	Al Najour	85
2	Rita	Data	69

- **Count , Having , Group by, Order by**

- **Question:** Find the customer Id, name and last name of customers who have placed more than one order and list them in alphabetical order.

```
SELECT DISTINCT c.CustomerId, c.FirstName, c.LastName
FROM Customer c
JOIN Order o on c.CustomerId = o.CustomerId
GROUP BY c.CustomerId, c.FirstName, c.LastName
HAVING COUNT(o.OrderId) > 1
ORDER BY c.FirstName, c.LastName;
```

CustomerId	FirstName	LastName
1	Anthony	Al Najour
2	Rita	Data