😊 Primary and Foreign Key Constraints

Primary keys and foreign keys are two types of constraints that can be used to enforce data integrity in SQL Server tables. These are important database objects.

😄 Primary Key Constraints:

A table typically has a column or combination of columns that contain values that uniquely identify each row in the table. This column, or columns, is called the primary key (PK) of the table and enforces the entity integrity of the table. Because primary key constraints guarantee unique data, they're frequently defined on an identity column.

When you specify a primary key constraint for a table, the Database Engine enforces data uniqueness by automatically creating a unique index for the primary key columns. This index also permits fast access to data when the primary key is used in queries. If a primary key constraint is defined on more than one column, values may be duplicated within one column, but each combination of values from all the columns in the primary key constraint definition must be unique.

As shown in the following illustration, the ProductID and VendorID columns in the Purchasing.ProductVendor table form a composite primary key constraint for this table. This makes sure that every row in the ProductVendor table has a unique combination of ProductID and VendorID. This prevents the insertion of duplicate rows.

Primary Key

ProductID	VendorID	AverageLeadTime	StandardPrice	LastReceiptCost
1	1	17	47.8700	50.2635
2	104	19	39.9200	41.9160
7	4	17	54.3100	57.0255
609	7	17	25.7700	27.0585
609	100	19	28.1700	29.5785

ProductVendor table

- A table can contain only one primary key constraint.
- A primary key can't exceed 16 columns and a total key length of 900 bytes.
- The index generated by a primary key constraint can't cause the number of indexes on the table to exceed 999 nonclustered indexes and 1 clustered index.
- If clustered or nonclustered isn't specified for a primary key constraint, clustered is used if there's no clustered index on the table.
- All columns defined within a primary key constraint must be defined as not null. If nullability isn't specified, all columns participating in a primary key constraint have their nullability set to not null.
- If a primary key is defined on a CLR user-defined type column, the implementation of the type must support binary ordering.

😄 Foreign Key Constraints

A foreign key (FK) is a column or combination of columns that is used to establish and enforce a link between the data in two tables to control the data that can be stored in the foreign key table. In a foreign key reference, a link is created between two tables when the column or columns that hold the primary key value for one table are referenced by the column or columns in another table. This column becomes a foreign key in the second table.

For example, the Sales.SalesOrderHeader table has a foreign key link to the Sales.SalesPerson table because there's a logical relationship between sales orders and salespeople. The SalesPersonID column in the SalesOrderHeader table matches the primary key column of the SalesPerson table. The SalesPersonID column in the SalesOrderHeader table is the foreign key to the SalesPerson table. By creating this foreign key relationship, a value for SalesPersonID can't be inserted into the SalesOrderHeader table if it doesn't already exist in the SalesPerson table.

A table can reference a maximum of 253 other tables and columns as foreign keys (outgoing references). SQL Server 2016 (13.x) increases the limit for the number of other tables and columns that can reference columns in a single table (incoming references), from 253 to 10,000. (Requires at least 130 compatibility level.) The increase has the following restrictions:

- Greater than 253 foreign key references are only supported for DELETE DML operations. UPDATE and MERGE operations aren't supported.
- A table with a foreign key reference to itself is still limited to 253 foreign key references.
- Greater than 253 foreign key references aren't currently available for columnstore indexes, memory-optimized tables, Stretch Database, or partitioned foreign key tables.

😄 Creating Tables with Keys:

1. Now when it comes to creating tables with primary keys and foreign keys. I have the SQL script in place that creates three tables. One is a customer table that has the customer ID and the customer's name.
2. You can get this Script with other scripts as well on GitHub.
3. Below is the Script which we are going to use in this lab.
4. First we are going to copy the create statements and create our 3 tables.

```
CREATE TABLE Customer (
   CustomerID varchar(100) NOT NULL,
   CustomerName varchar(1000),
   PRIMARY KEY (CustomerID)
);


CREATE TABLE Course (
   CourseID varchar(100) NOT NULL,
   CourseName varchar(1000),
```

```
    Price real,
    PRIMARY KEY (CourseID)
);


CREATE TABLE Orders (
    OrderID varchar(100) NOT NULL,
    CourseID varchar(100),
    CustomerID varchar(100),
    Discountpercent int,
    PRIMARY KEY (OrderID),
    FOREIGN KEY (CustomerID) REFERENCES Customer(CustomerID),
    FOREIGN KEY (CourseID) REFERENCES Course(CourseID)
);

INSERT INTO Customer(CustomerID,CustomerName) VALUES ('C1','UserA');
INSERT INTO Customer(CustomerID,CustomerName) VALUES ('C2','UserB');
INSERT INTO Customer(CustomerID,CustomerName) VALUES ('C3','UserC');

SELECT * FROM Customer;

INSERT INTO COURSE(CourseID,CourseName,Price) VALUES ('D1','AZ-900',99.99);
INSERT INTO COURSE(CourseID,CourseName,Price) VALUES ('D2','DP-900',100.99);
INSERT INTO COURSE(CourseID,CourseName,Price) VALUES ('D3','AZ-104',89.99);

SELECT * FROM Course;

INSERT INTO Orders(OrderID,CourseID,CustomerID,Discountpercent) VALUES
('O1','D2','C1',90);
INSERT INTO Orders(OrderID,CourseID,CustomerID,Discountpercent) VALUES
('O2','D1','C2',50);
INSERT INTO Orders(OrderID,CourseID,CustomerID,Discountpercent) VALUES
('O3','D3','C3',60);
```

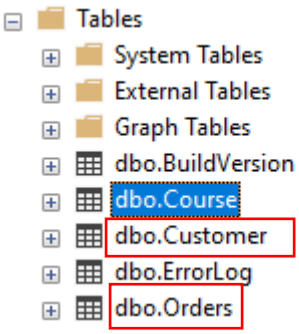
5. Below you can see that we have all of the tables in place.

```
CREATE TABLE Customer (
    CustomerID varchar(100) NOT NULL,
    CustomerName varchar(1000),
    PRIMARY KEY (CustomerID)
);


CREATE TABLE Course (
    CourseID varchar(100) NOT NULL,
    CourseName varchar(1000),
    Price real,
    PRIMARY KEY (CourseID)
);


CREATE TABLE Orders (
    OrderID varchar(100) NOT NULL,
    CourseID varchar(100),
    CustomerID varchar(100),
    Discountpercent int,
    PRIMARY KEY (OrderID),
    FOREIGN KEY (CustomerID) REFERENCES Customer(CustomerID),
    FOREIGN KEY (CourseID) REFERENCES Course(CourseID)
);
```

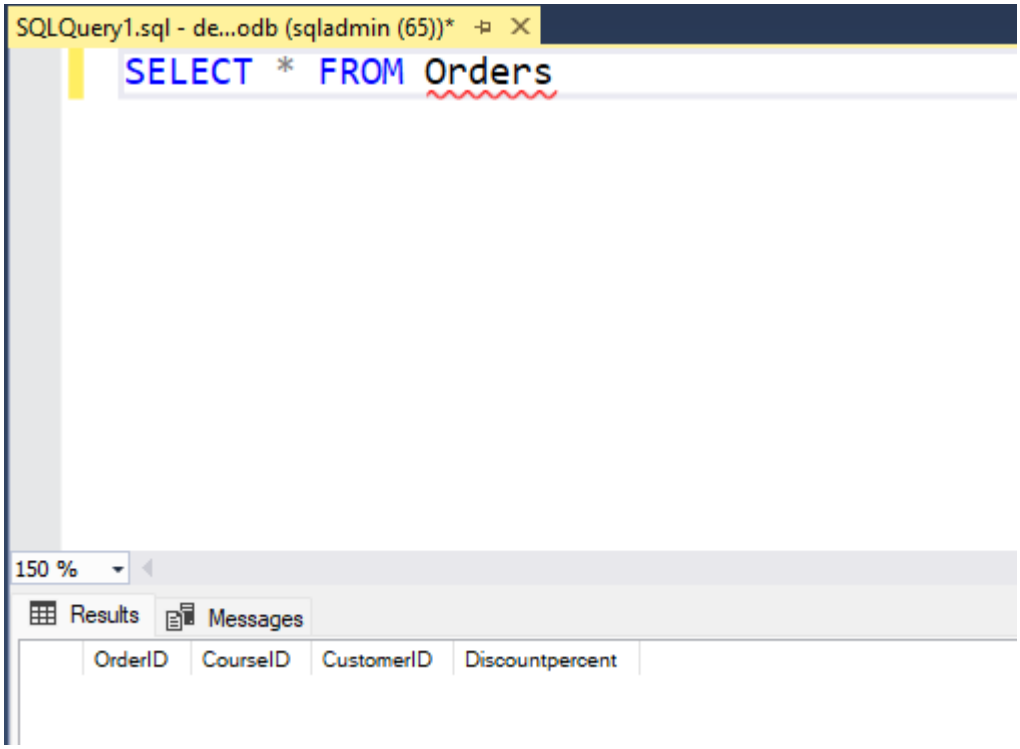
```
Commands completed successfully.

Completion time: 2024-04-15T16:28:18.9926856+05:30
```

Query executed successfully.

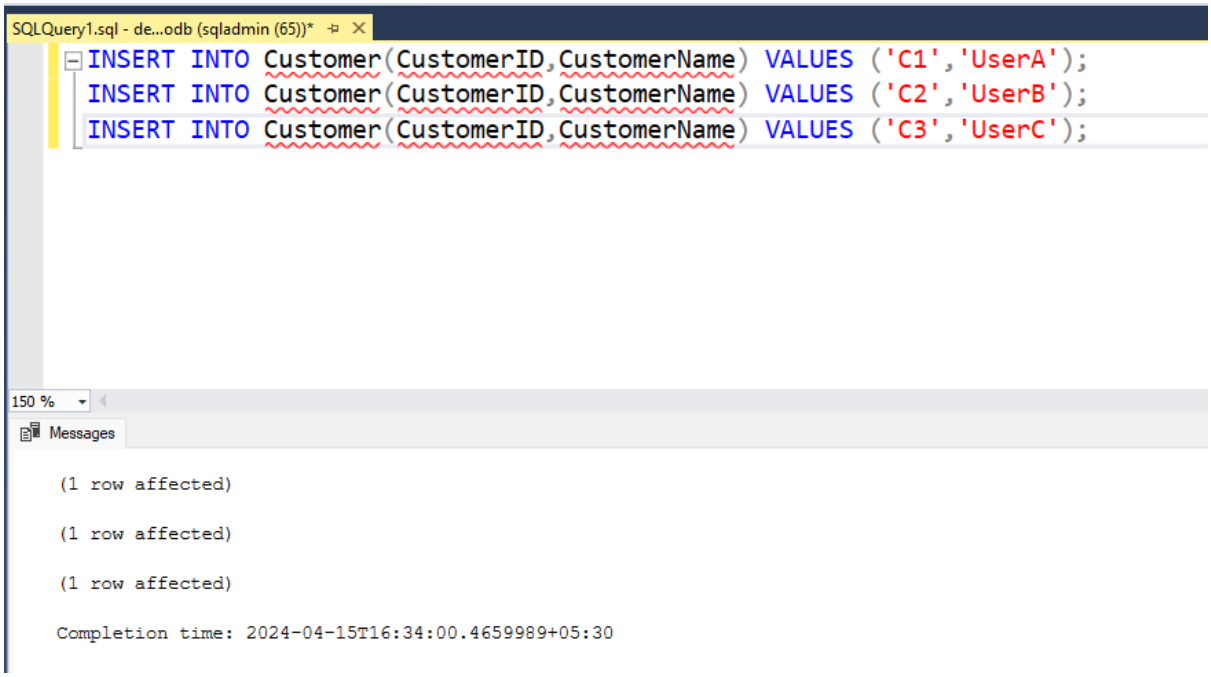
6. Now from the left pane if you select the table section hit the refresh button and wait then we can see our tables.



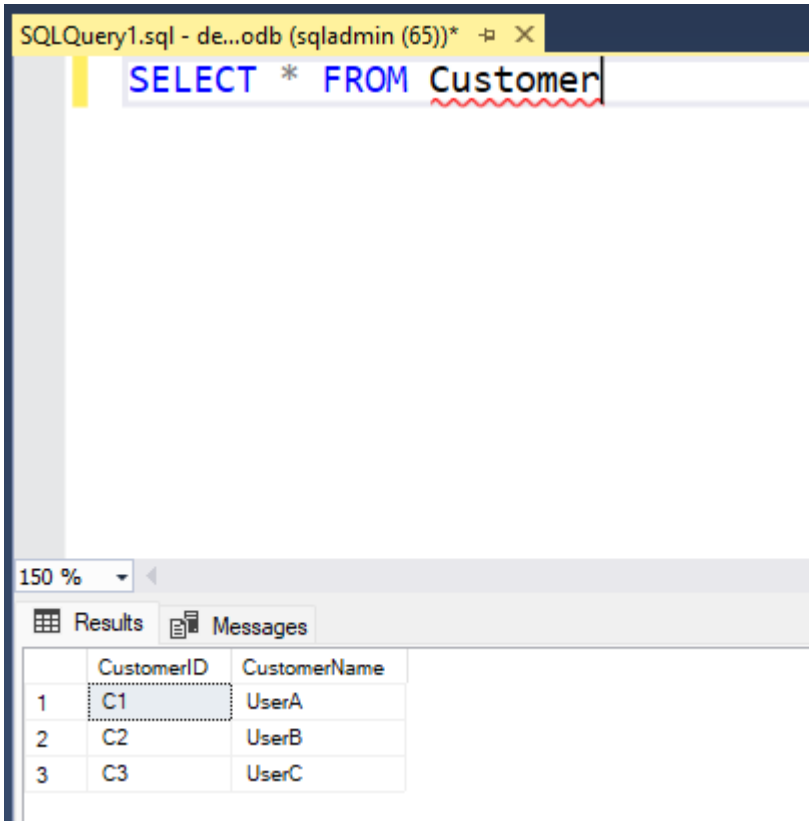
7. Currently there is no information in these tables. Now if you will try to select and view the data you will find them empty. You can see below nothing is there in our orders table same goes for the other tables too.



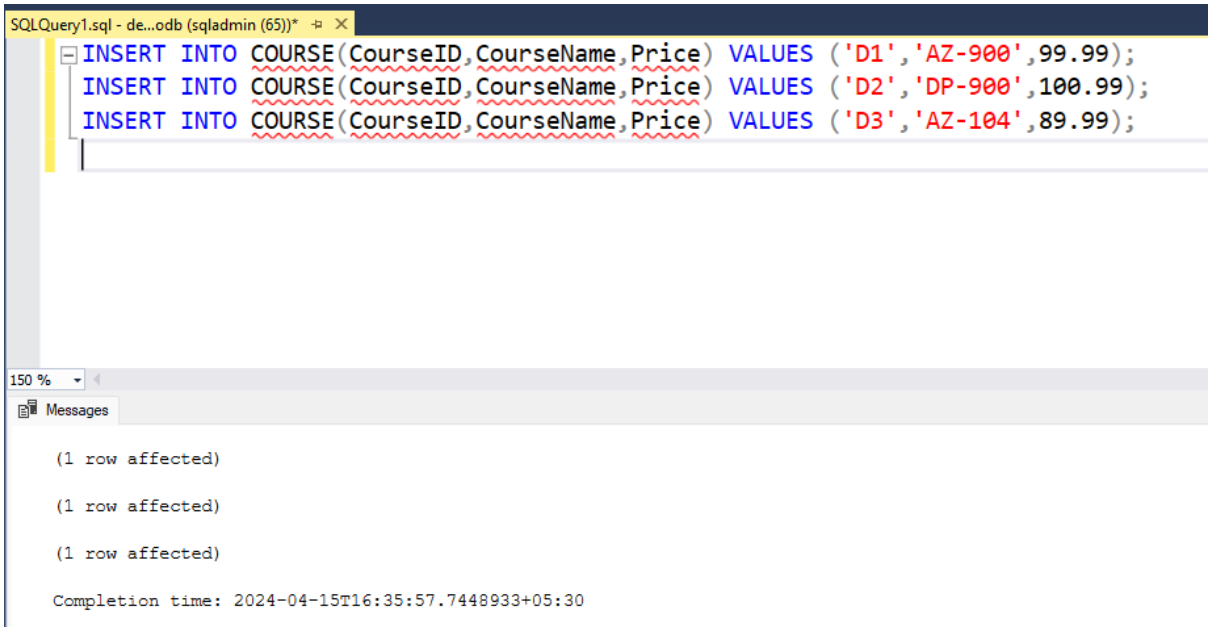
8. Now we are going to insert some values in these tables. First is Customer table.

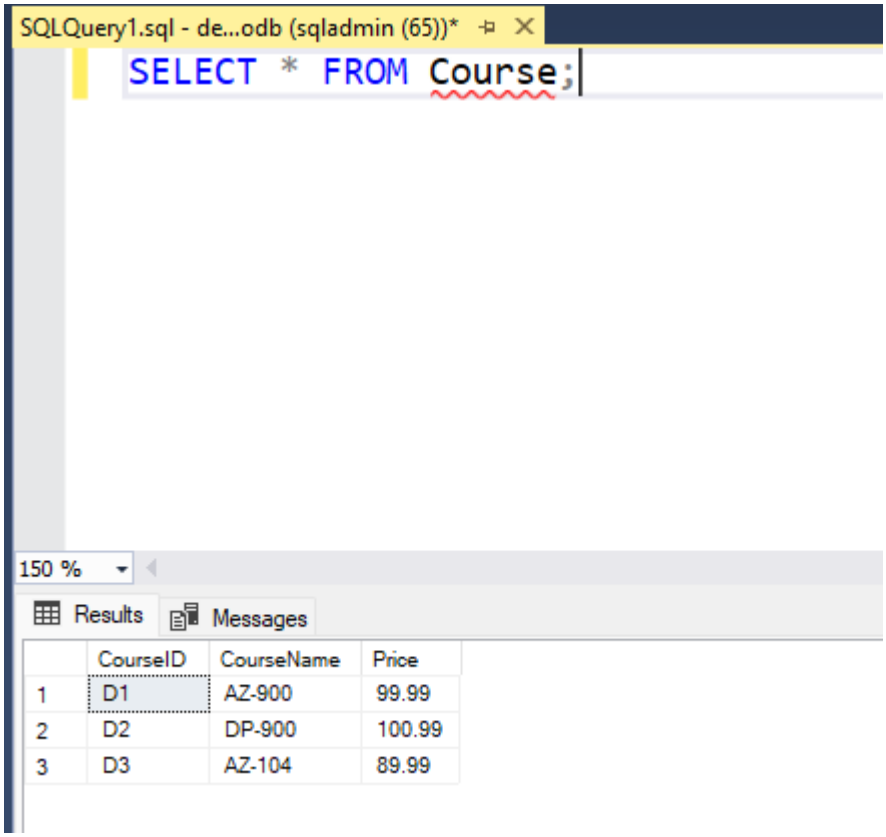


9. Now if do a Select statement so, you will be able to see the data.

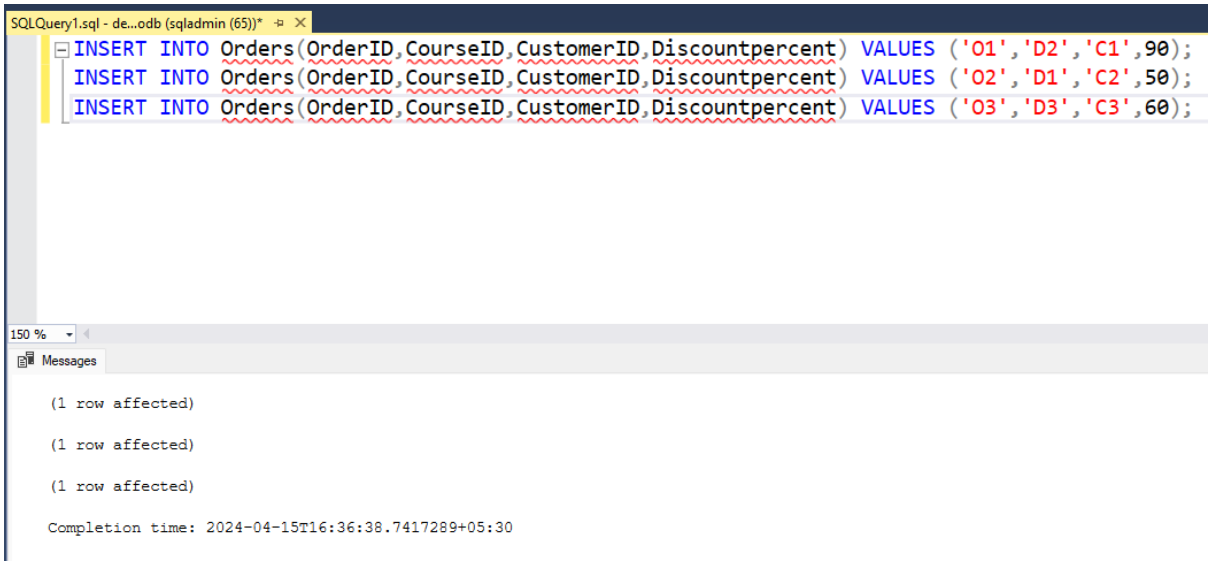


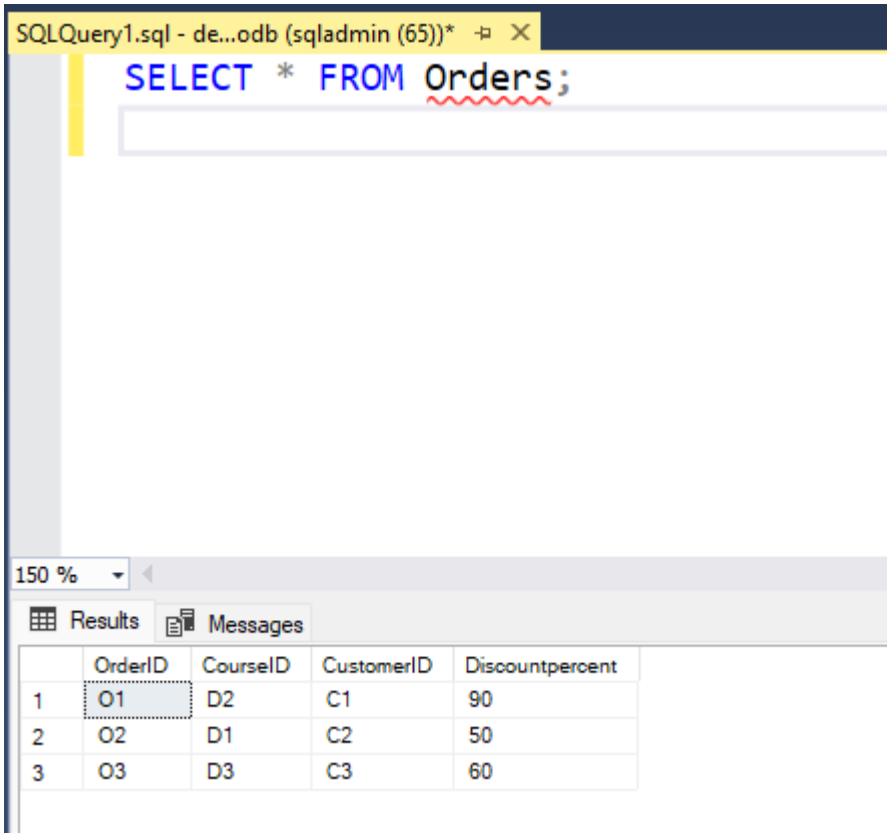
10. Now we are going to do the same for rest of the tables too.
11. Below is the Course table and the output.





12. Below is the Orders table and the output as well.

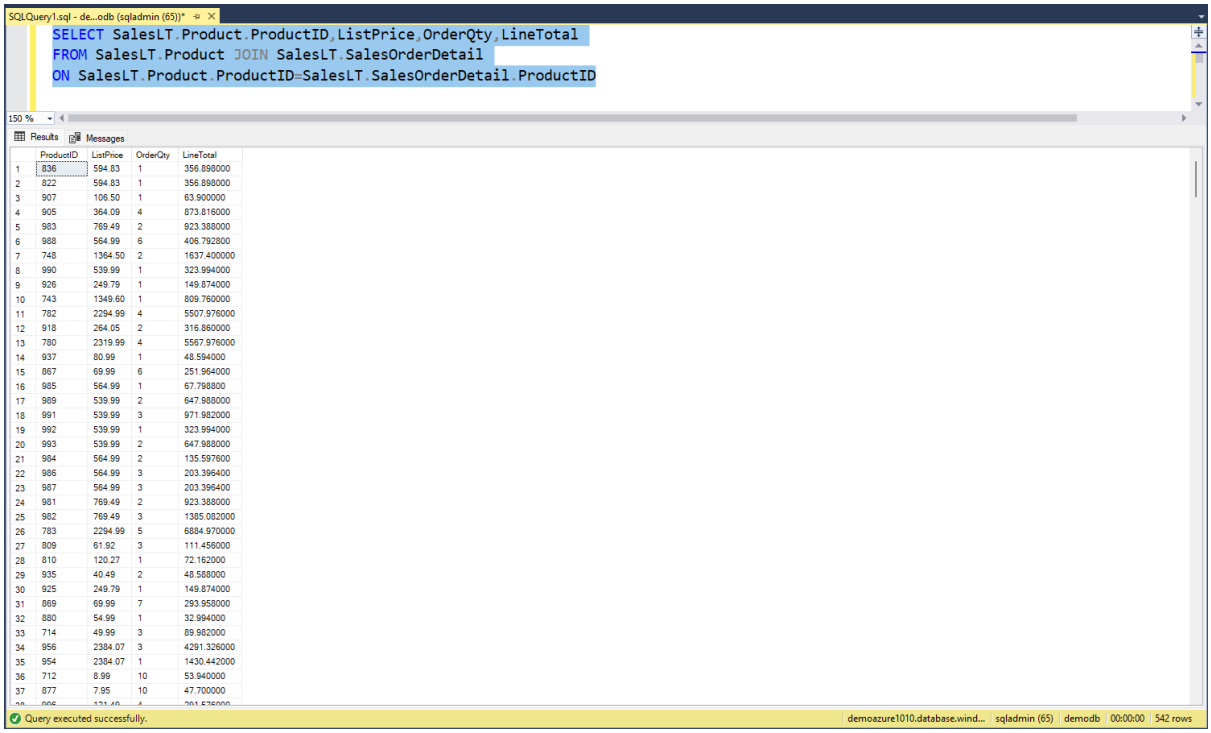




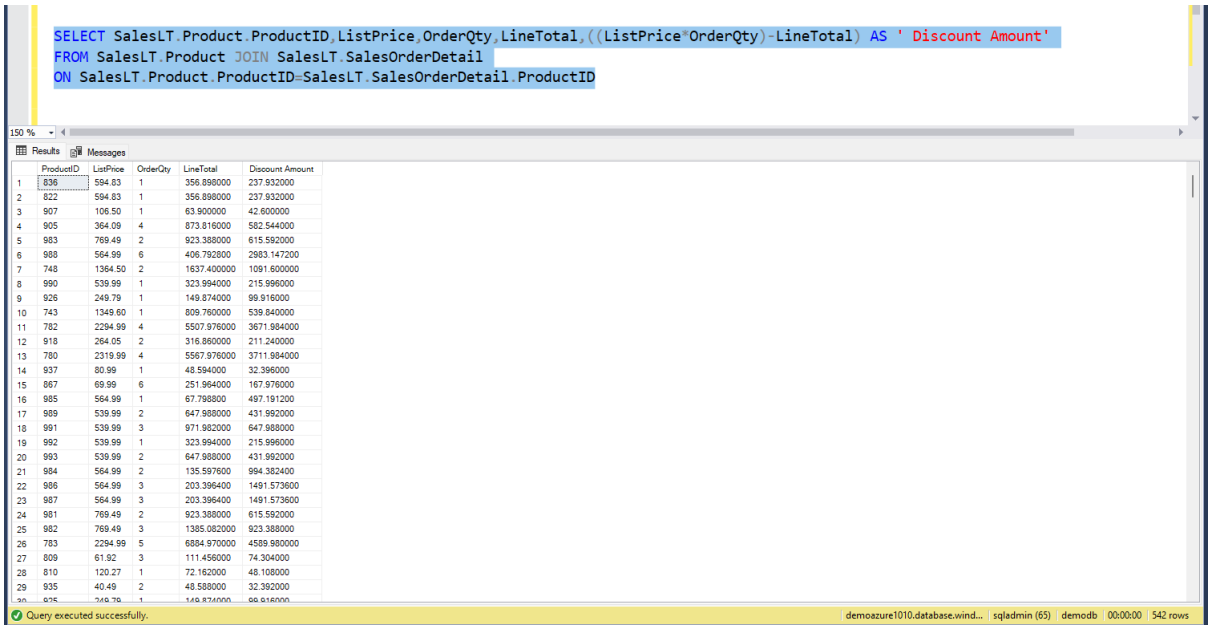
	OrderID	CourseID	CustomerID	Discountpercent
1	O1	D2	C1	90
2	O2	D1	C2	50
3	O3	D3	C3	60

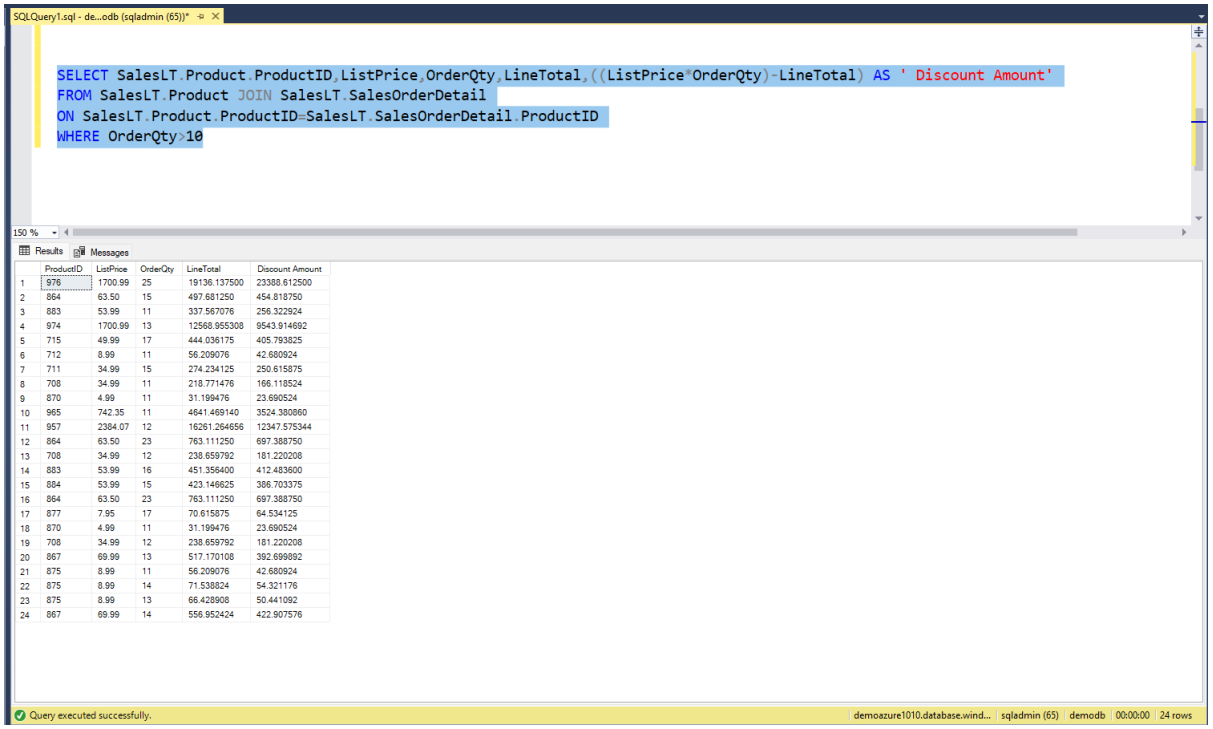
😄 JOIN Clause

1. The JOIN clause in SQL is used to combine rows from two or more tables based on a related column between them. It allows you to retrieve data from multiple tables in a single query, enabling you to create more complex queries that involve data from different parts of a database.
2. Below you can see a command that is used to join 2 tables, one is the Product table, and the other is the Sales order details table.
3. Below you can see that we get the output accordingly.



4. Now in the next command we are doing some computation.





	ProductID	ListPrice	OrderQty	LineTotal	Discount Amount
1	976	1700.99	25	19136.137500	23388.612500
2	864	63.50	15	497.681250	454.818750
3	883	53.99	11	337.567076	256.322924
4	974	1700.99	13	12568.955308	9543.914692
5	715	49.99	17	444.036175	405.793825
6	712	8.99	11	56.209076	42.680924
7	711	34.99	15	274.234125	250.615875
8	708	34.99	11	218.771476	166.118524
9	870	4.99	11	31.199476	23.690524
10	965	742.35	11	4641.469140	3524.380860
11	957	2384.07	12	16261.264656	12347.575344
12	864	63.50	23	763.111250	697.388750
13	708	34.99	12	238.659792	181.220208
14	883	53.99	16	451.356400	412.483600
15	884	53.99	15	423.146625	386.703375
16	864	63.50	23	763.111250	697.388750
17	877	7.95	17	70.615875	64.534125
18	870	4.99	11	31.199476	23.690524
19	708	34.99	12	238.659792	181.220208
20	867	69.99	13	517.170108	392.699892
21	875	8.99	11	56.209076	42.680924
22	875	8.99	14	71.538824	54.321176
23	875	8.99	13	66.428908	50.441092
24	867	69.99	14	556.952424	422.907576