# SQL-Optimzation and Performance

# PIVOT

PIVOT rotates a table-valued expression by turning the unique values from one column in the expression into multiple columns in the output. And PIVOT runs aggregations where they're required on any remaining column values that are wanted in the final output.

**Syntax:**

```
SELECT <non-pivoted column>, [first pivoted column] AS <column name>,
[second pivoted column] AS <column name>,  ...
  [last pivoted column] AS <column name>
FROM
  (<SELECT query that produces the data>)  AS <alias for the source
  query> PIVOT  (  <aggregation function>(<column being aggregated>)
FOR
[<column that contains the values that will become column headers>]
  IN ( [first pivoted column], [second pivoted column],
  ... [last pivoted column])
) AS <alias for the pivot table>
<optional ORDER BY clause>;
```

# PIVOT

Create a pivot table that depicts the average fuel prices sorted by first five stores

```
SELECT 'AverageFuelPrice' AS Price_sorted_by_store,
[1], [2], [3], [4],[5]  into Pivot_table
FROM  ( SELECT Store, Fuel_Price
FROM Feature) AS SourceTable  PIVOT
( AVG(Fuel_Price)
FOR store IN ([1],[2],[3],[4],[5] ) AS PivotTable;
```

| Price_sorted_by_store | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| AverageFuelPrice | 3.24347928995211 | 3.24347928995211 | 3.24347928995211 | 3.2409940852216 | 3.24347928995211 |

# UNPIVOT

UNPIVOT carries out the opposite operation to PIVOT by rotating columns of a table-valued expression into column values.

Reverse the pivoting mentioned in the previous question using the unpivot operator and display the records.

```
SELECT Store, AverageFuelPrice
into UnPivot_Table
FROM
 (SELECT Price_sorted_by_store,
 [1],[2],[3],[4],[5]
 FROM Pivot_table) u
 UNPIVOT
 (AverageFuelPrice FOR Store IN
    ([1],[2],[3],[4],[5])
 )AS unpvt;
```

| Store | AverageFuelPrice |
|---|---|
| 1 | 3.24347928995211 |
| 2 | 3.24347928995211 |
| 3 | 3.24347928995211 |
| 4 | 3.2409940852216 |
| 5 | 3.24347928995211 |

# STUFF

The STUFF function inserts a string into another string. It deletes a specified length of characters in the first string at the start position and then inserts the second string into the first string at the start position.

Create a query to implement a stuff function on any value from the Store_Name column of the Store details table.

**Syntax:**

*STUFF ( character_expression , start , length , replacewith_expression )*

```
SELECT Store_Name,  STUFF('Walmart',
7, 8, 'store') as Stuffed_column from
Store_details
```

| Store_Name | Stuffed_column |
|---|---|
| Walmart | Walmarstore |

# Indexes

An INDEX can be defined as a mechanism for providing fast access to table rows and for enforcing constraints.

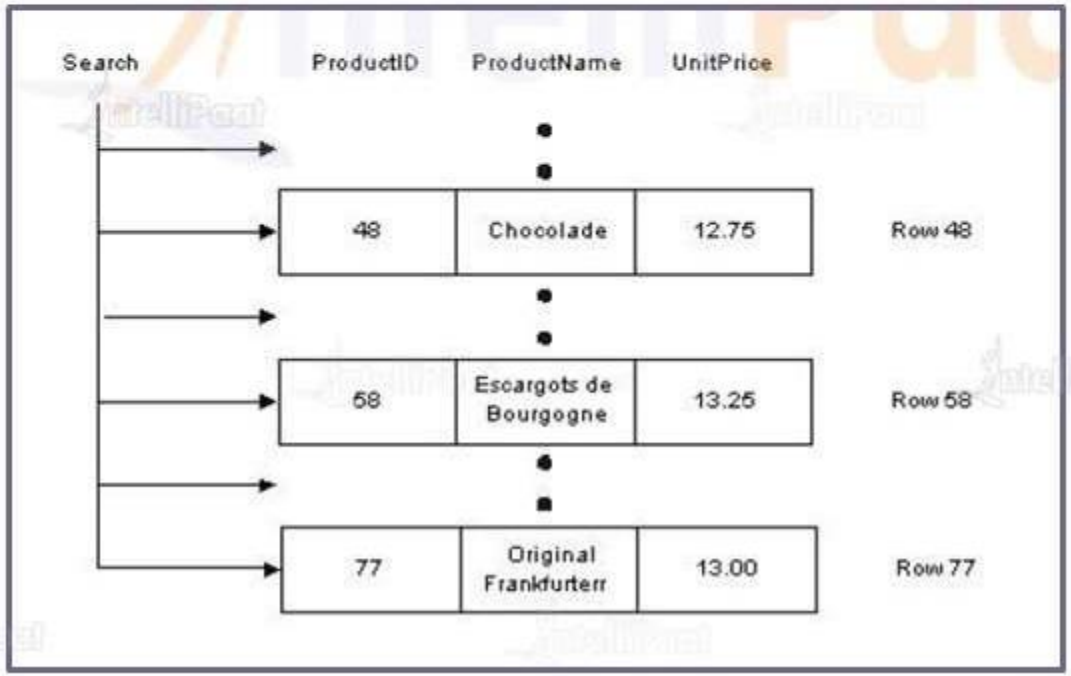
- When data volumes increase, organizations face the problems related to data retrieval and posting. They feel the need for a mechanism that will increase the speed of data access.
- An index, like the index of a book, enables the database retrieve and present data to the end user with ease.
- When a SQL Server has NO index to use for searching, the result is similar to the reader who looks at every page in a book to find a word: the SQL engine needs to visit every row in a table.
- In database terminology we call this behaviour a **TABLE SCAN**, or just **SCAN**.

# With No Indexes Defined..

Consider the following query on the Products table (with NO index of the Northwind database. This query retrieves products in a specific price range ( 12.5 — 14).

```
SELECT ProductID, ProductName, UnitPrice FROM Products WHERE (UnitPrice > 12.5) AND (UnitPrice < 14)
```

In the diagram below, the database search touches a total of 77 records to find just three matches



# With No Indexes Defined..

- Now imagine if we CREATED an index, just like a book index, on the data in the UnitPrice column.
- Each index entry would contain a copy of the UnitPrice value for a row, and a reference (just like a page number) to the row where the value originated.
- SQL will sort these index entries into ascending order.
- The index will allow the database to quickly narrow in on the three rows to satisfy the query, and avoid scanning every row in the table.

# Creating Indexes

The command specifies the name of the index (IDX_UnitPrice), the table name (Products), and the column to index (UnitPrice).

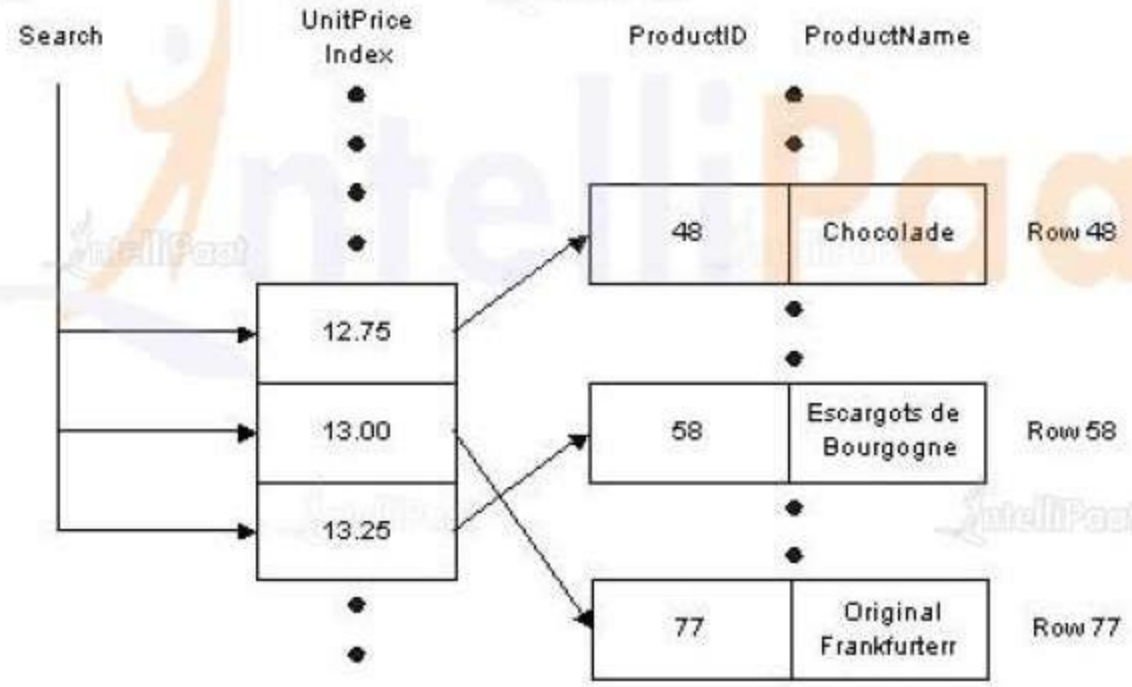
```
CREATE INDEX IIDX_UnitPrice] ON Products (UnitPrice)
```

To verify that the index is created, use the following stored procedure to see a list of all indexes on the Products table:

```
EXEC sp_helpindex Products
```

# How It works

The database takes the columns specified in a **CREATE INDEX** command and sorts the values into a special data structure known as a B-tree.



# How It works

- On the left, each index entry contains the index key **(UnitPrice)**.
- Each entry also includes a reference (which points) to the table rows which share that particular value and from which we can retrieve the required information.
- Much like the index in the back of a book helps us to find keywords quickly, so the database is able to quickly narrow the number of records it must examine to a minimum by using the sorted list of **UnitPrice** values stored in the index.
- We have avoided a table scan to fetch the query results

# Index Advantages

- The database engine can use indexes to boost performance in a number of different queries.
- An important feature of versions SQL Server 2005 and above is a component known as the query optimizer.
- The query optimizer's job is to find the fastest and least resource intensive means of executing incoming queries.
- An important part of this job is selecting the best index or indexes to perform the task.

# Searching for Records

The most obvious use for an index is in finding a record or set of records matching a WHERE clause.

Indexes can aid queries looking for values inside of a range (as we demonstrated earlier), as well as queries looking for a specific value.

By way of example, the following queries can all benefit from an index on **UnitPrice**:

```
DELETE FROM Products WHERE UnitPrice = 1
UPDATE Products SET Discontinued = 1 WHERE UnitPrice > 15
SELECT * FROM PRODUCTS WHERE UnitPrice BETWEEN 14 AND 16
```

Indexes work just as well when searching for a record in DELETE and UPDATE commands as they do for SELECT statements.

# Searching for Records

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```

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# Sorting for Records

When we ask for a sorted dataset, the database will try to find an index and avoid sorting the results during execution of the query.

We control sorting of a dataset by specifying a field, or fields, in an ORDER BY clause, with the sort order as ASC (ascending) or DESC (descending)


```
SELECT * FROM Products ORDER BY UnitPrice ASC
```

The database can simply scan the index from the first entry to the last entry and retrieve the rows in sorted order.
The same index works equally well with the following query, simply by scanning the index in reverse.

```
SELECT * FROM Products ORDER BY UnitPrice DESC
```

# Grouping Records

We can use a **GROUP BY** clause to group records and aggregate values, for example, counting the number of orders placed by a customer.

To process a query with a GROUP BY clause, the database will often sort the results on the columns included in the GROUP BY.


*SELECT Count(*), UnitPrice FROM Products GROUP BY UnitPrice*

The database can use the IDX UnitPrice index to retrieve the prices in order.

- ✓ **Since matching prices appear in consecutive index entries, the database is able count the number of products at each price quickly.**

# Clustered Indexes

Notice here in the "student" table we have set primary key constraint on the "id" column. This automatically creates a clustered index on the "id" column. To see all the indexes on a particular table execute "sp_helpindex" stored procedure. This stored procedure accepts the name of the table as a parameter and retrieves all the indexes of the table. The following query retrieves the indexes created on student table.

```
USE schooldb

EXECUTE sp_helpindex student
```

The above query will return this result:

| index_name | index_description | index_keys |
|---|---|---|
| PK__student__3213E83F7F60ED59 | clustered, unique, primary key located on PRIMARY | id |

# Clustered Indexes

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USE schooldb

EXECUTE sp_helpindex student
```

The above query will return this result:

| index_name | index_description | index_keys |
|---|---|---|
| PK__student__3213E83F7F60ED59 | clustered, unique, primary key located on PRIMARY | id |

# Clustered Indexes

A clustered index defines the order in which data is physically stored in a table. Table data can be sorted in only way, therefore, there can be only one clustered index per table. In SQL Server, the primary key constraint automatically creates a clustered index on that particular column.

Let's take a look. First, create a "student" table inside "schooldb" by executing the following script:

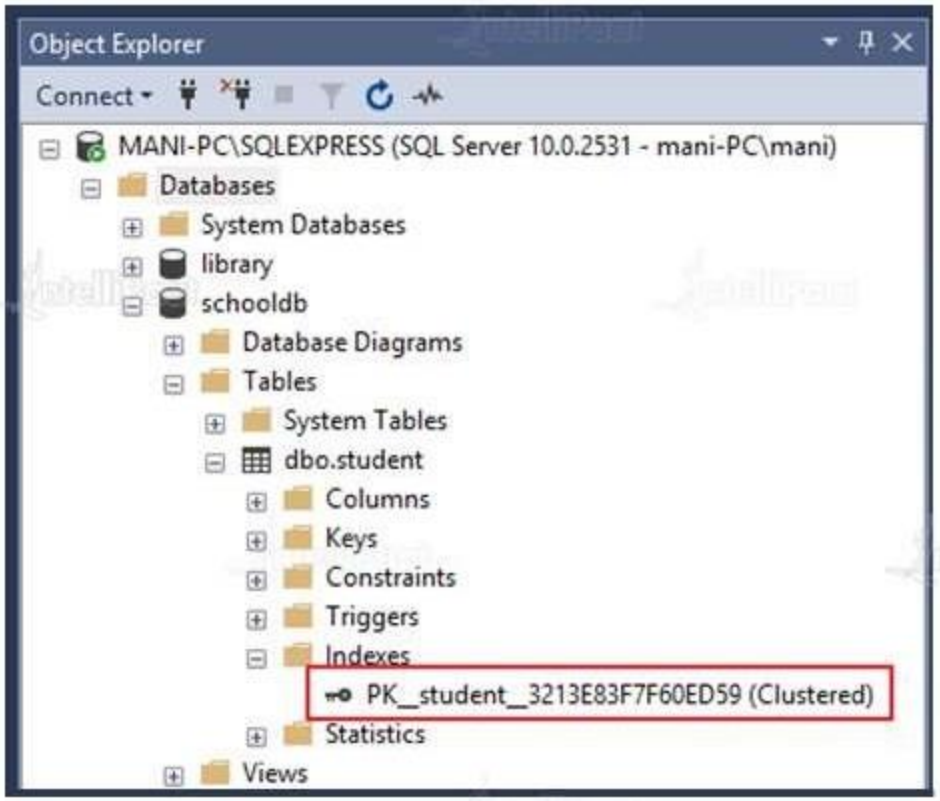
```
CREATE DATABASE schooldb

CREATE TABLE student
(
    id INT PRIMARY KEY,
    name VARCHAR(50) NOT NULL,
    gender VARCHAR(50) NOT NULL,
    DOB datetime NOT NULL,
    total_score INT NOT NULL,
    city VARCHAR(50) NOT NULL
)
```

Notice here in the "student" table we have set primary key constraint on the "id" column. This automatically creates a clustered index on the "id" column. To see all the indexes on a particular table execute "sp_helpindex" stored procedure. This stored procedure accepts the name of the table as a parameter and retrieves all the indexes of the table. The following query retrieves the indexes created on student table.

# Clustered Indexes

In the output you can see the only one index. This is the index that was automatically created because of the primary key constraint on the "**id**" column.

Another way to view table indexes is by going to "Object Explorer-> Databases-> Database_Name-> Tables-> Table_Name -> Indexes". Look at the following screenshot for reference.



# Clustered Indexes

This clustered index stores the record in the student table in the ascending order of the “id”. Therefore, if the inserted record has the id of 5, the record will be inserted in the 5th row of the table instead of the first row. Similarly, if the fourth record has an id of 3, it will be inserted in the third row instead of the fourth row. This is because the clustered index has to maintain the physical order of the stored records according to the indexed column i.e. id. To see this ordering in action, execute the following script:

```
USE schooldb

INSERT INTO student

VALUES
(6, 'Kate', 'Female', '03-JAN-1985', 500, 'Liverpool'),
(2, 'Jon', 'Male', '02-FEB-1974', 545, 'Manchester'),
(9, 'Wise', 'Male', '11-NOV-1987', 499, 'Manchester'),
(3, 'Sara', 'Female', '07-MAR-1988', 600, 'Leeds'),
(1, 'Jolly', 'Female', '12-JUN-1989', 500, 'London'),
(4, 'Laura', 'Female', '22-DEC-1981', 400, 'Liverpool'),
(7, 'Joseph', 'Male', '09-APR-1982', 643, 'London'),
(5, 'Alan', 'Male', '29-JUL-1993', 500, 'London'),
(8, 'Mice', 'Male', '16-AUG-1974', 543, 'Liverpool'),
(10, 'Elis', 'Female', '28-OCT-1990', 400, 'Leeds');
```

# Clustered Indexes

The above script inserts ten records in the student table. Notice here the records are inserted in random order of the values in the "id" column. But because of the default clustered index on the id column, the records are physically stored in the ascending order of the values in the "id" column. Execute the following SELECT statement to retrieve the records from the student table.

```
USE schooldb

SELECT * FROM student
```

The records will be retrieved in the following order:

# Clustered Indexes

The records will be retrieved in the following order:

| id | name | gender | DOB | total_score | city |
|---|---|---|---|---|---|
| 1 | Jolly | Female | 1989-06-12 00:00:00.000 | 500 | London |
| 2 | Jon | Male | 1974-02-02 00:00:00.000 | 545 | Manchester |
| 3 | Sara | Female | 1988-03-07 00:00:00.000 | 600 | Leeds |
| 4 | Laura | Female | 1981-12-22 00:00:00.000 | 400 | Liverpool |
| 5 | Alan | Male | 1993-07-29 00:00:00.000 | 500 | London |
| 6 | Kate | Female | 1985-01-03 00:00:00.000 | 500 | Liverpool |
| 7 | Joseph | Male | 1982-04-09 00:00:00.000 | 643 | London |
| 8 | Mice | Male | 1974-08-16 00:00:00.000 | 543 | Liverpool |
| 9 | Wise | Male | 1987-11-11 00:00:00.000 | 499 | Manchester |
| 10 | Elis | Female | 1990-10-28 00:00:00.000 | 400 | Leeds |

# Clustered Index

It defines the order in which the table data will be sorted and stored. Defining a clustered index on a column will sort the data based on the column values and will store it. Thus, it helps in faster retrieval of the data.

Organize the data of the store table using cluster index

**Syntax:**

```
CREATE CLUSTERED INDEX <index_name>
ON
[schema.]<table_name>(column_name
[asc|desc]);
```

```
CREATE CLUSTERED INDEX
CIX_store_storeid
ON dbo.store(store_id)
select * from store
```

| Store_id | Accessories | ExpiryDate |
|---|---|---|
| 8 | Laptop | NULL |
| 5 | Laptop | NULL |
| 1 | Laptop | NULL |
| 3 | Laptop | NULL |
| 6 | Laptop | NULL |
| 2 | Laptop | NULL |
| 4 | Laptop | NULL |
| 7 | Laptop | NULL |

Unsorted data

| Store_id | Accessories | ExpiryDate |
|---|---|---|
| 1 | Laptop | NULL |
| 2 | Laptop | NULL |
| 3 | Laptop | NULL |
| 4 | Laptop | NULL |
| 5 | Laptop | NULL |
| 6 | Laptop | NULL |
| 7 | Laptop | NULL |
| 8 | Laptop | NULL |

Sorted data

# Non-Clustered Index

Data is stored in one place and index is stored in another place same as an index of a book

Apply non cluster index on store_name of the given below store table

**Syntax:**

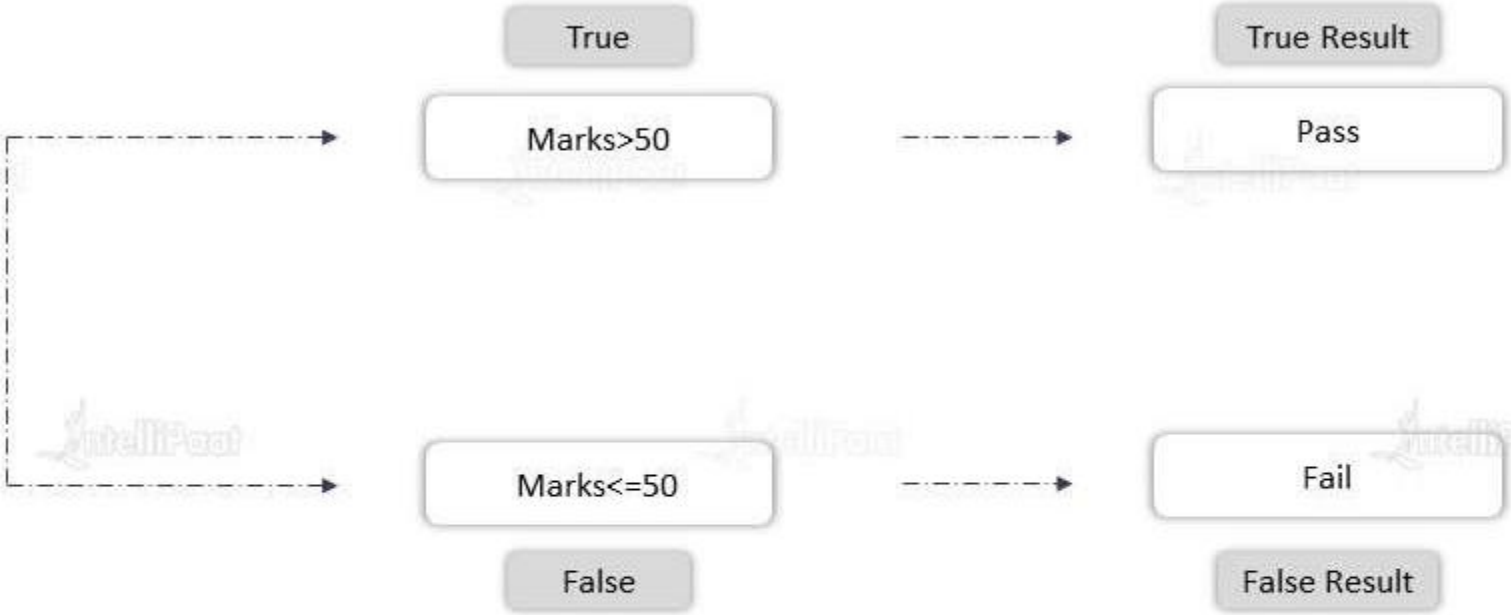
*CREATE NONCLUSTERED INDEX*
*<index_name> ON <table_name>(column)*

| Store_id | store_name | Sales |
|---|---|---|
| 1 | walmart | 25000 |
| 2 | titan | 18000 |
| 3 | h and m | 11000 |
| 4 | Amazon | 75000 |
| 5 | Wipro | 95000 |
| 6 | TCS | 67000 |
| 7 | Infosys | 55000 |
| 8 | abc | 15000 |

```
create nonclusteredindex nci_storefinal
on store10(Store_name Asc);
sp_helpindex store10
```

| index_name | index_description | index_keys |
|---|---|---|
| nci_storefinal | nonclustered located on PRIMARY | store_name |

# IIF Condition



# IIF Condition

IIF() function is an alternative for the case statement.

```
IIF (boolean_expression, true_value,
false_value )
```

# IIF Condition

Create a Store_Status column in the Sales to check whether the Store is open or closed.

**IIF()**

The IIF condition accepts three parameters.

1) CONDITION
2) TRUE
3) FALSE

**Syntax:**

***IIF (Condition, TRUE statement, FALSE statement)***

```
Select *, IIF(IsHoliday ='TRUE',
'Open','Closed') as Store_Status
from Sales
```

| | Store | Dept | Date | Weekly_Sales | IsHoliday | Store_Status |
|---|---|---|---|---|---|---|
| 1 | 8 | 5 | 05/08/2011 | 16183.33 | FALSE | Closed |
| 2 | 8 | 5 | 12/08/2011 | 16067.32 | FALSE | Closed |
| 3 | 8 | 5 | 19/08/2011 | 15966.62 | FALSE | Closed |
| 4 | 8 | 5 | 26/08/2011 | 11533.31 | FALSE | Closed |
| 5 | 8 | 5 | 02/09/2011 | 13594.54 | FALSE | Closed |
| 6 | 8 | 5 | 09/09/2011 | 12781.84 | TRUE | Open |
| 7 | 8 | 5 | 16/09/2011 | 15666.95 | FALSE | Closed |
| 8 | 8 | 5 | 23/09/2011 | 15107.2 | FALSE | Closed |
| 9 | 8 | 5 | 30/09/2011 | 16594.95 | FALSE | Closed |
| 10 | 8 | 5 | 07/10/2011 | 22372.88 | FALSE | Closed |
| 11 | 8 | 5 | 14/10/2011 | 18907.09 | FALSE | Closed |

# Composite Indexes

A composite index is an index on two or more columns.

Both clustered and non-clustered indexes can be composite indexes. Composite indexes are especially useful in two different circumstances.

# Purpose of correlated subqueries

Sometimes you have to answer more than one question in one sentence

**Multiple Questions**

Before you can answer your friend, you need to know the prices of the ticket, the popcorn, and the drink.

**Prerequisites**

**One Statement**

Your friend might ask you if you have enough money for a cinema ticket, popcorn, and a drink

**Safety**

You also need to see how much money you have in your pocket.

So actually, what seemed like an easy question, turns into four questions that you need answers to before you can say "Yes" or "No."

# Purpose of correlated subqueries

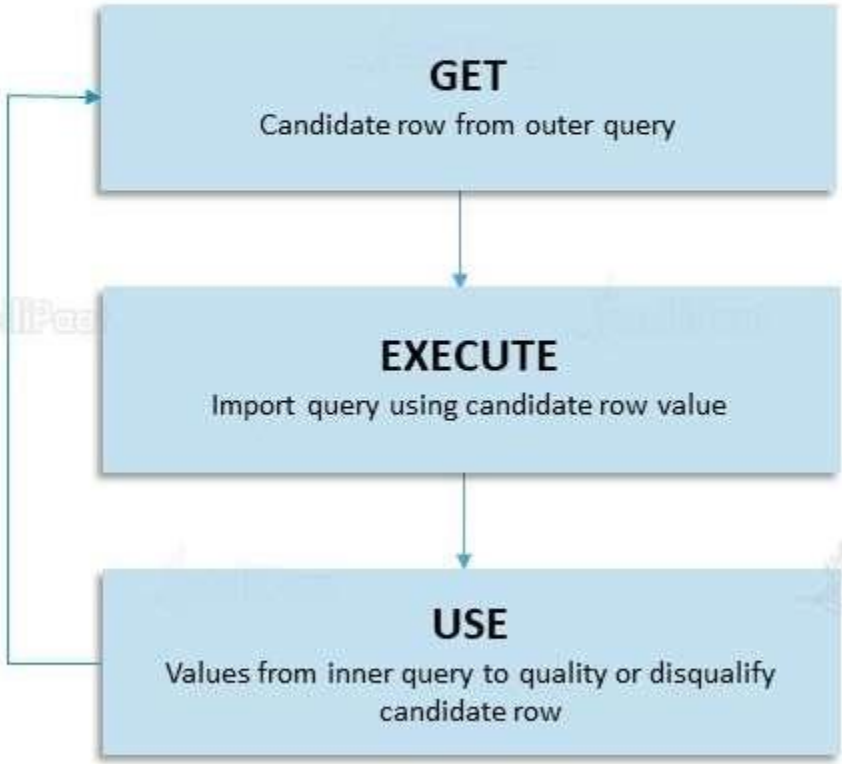
In business, you might get asked to produce a report of all employees earning more than the average salary for their departments.

So here you first have to calculate the average salary per department, and then compare the salary for each employee to the average salary of that employee's department.

# Correlated Subqueries

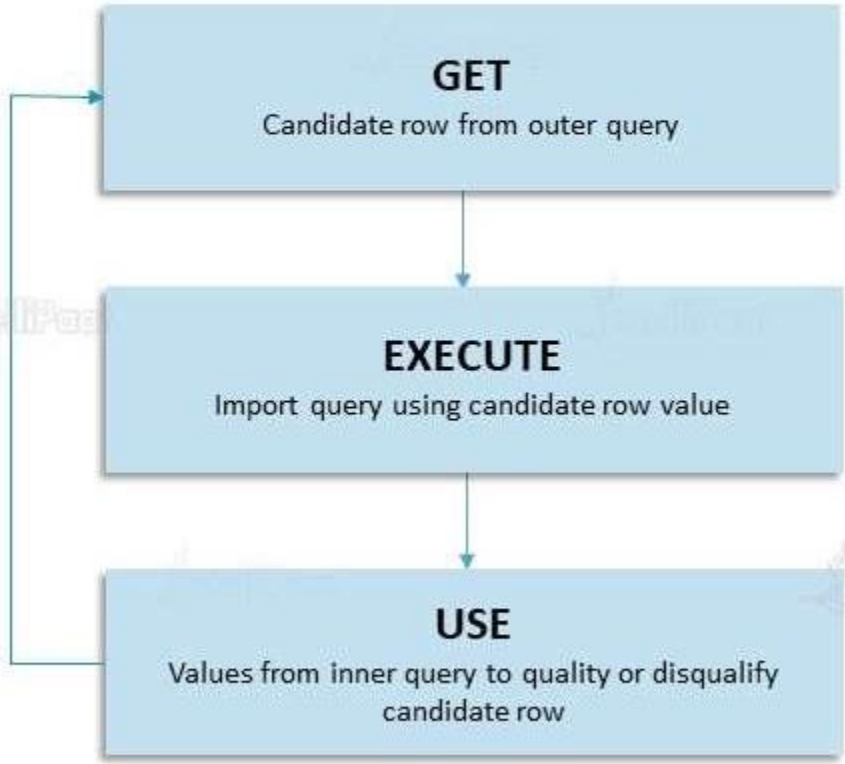
**Corelated Subqueries**

Correlated subqueries are used for row-by-row processing. Each subquery is executed once for every row of the outer query.



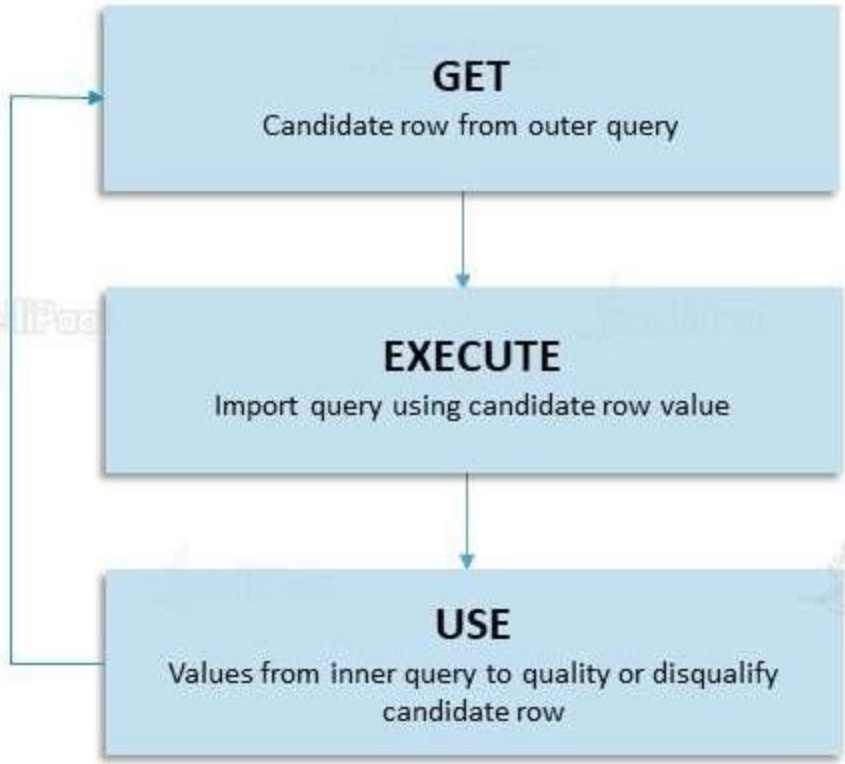
# Correlated Subqueries

A correlated subquery is evaluated once for each row processed by the parent statement.

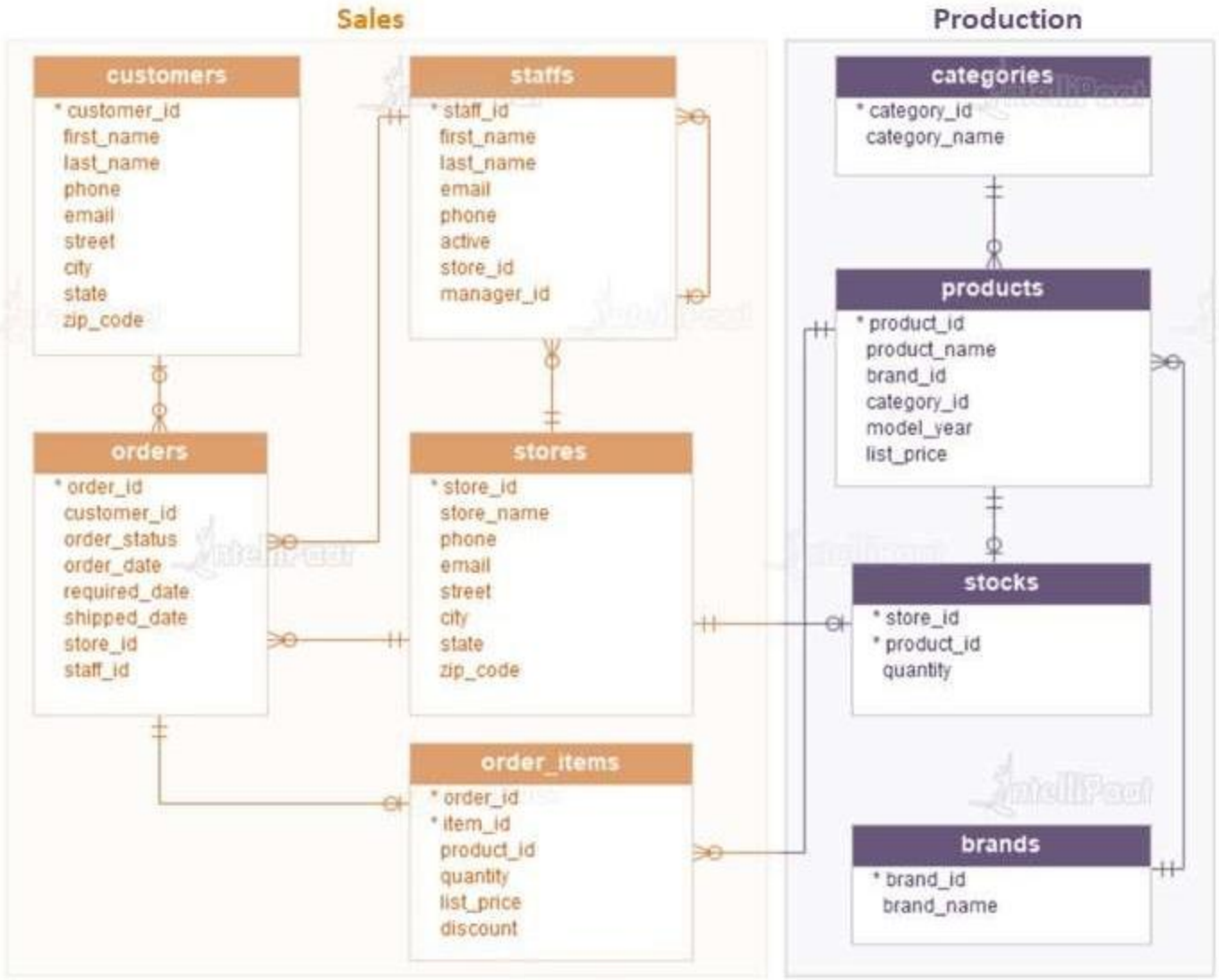


# Correlated Subqueries

The parent statement can be a SELECT, UPDATE, or DELETE statement.



# Correlated Subqueries: Example



# Correlated Subqueries: Example

Consider the following `products` table from the sample database:

# Correlated Subqueries: Example

The following example finds the products whose list price is equal to the highest list price of the products within the same category:

```
SELECT
    product_name,
    list_price,
    category_id
FROM
    production.products p1
WHERE
    list_price IN (
        SELECT
            MAX (p2.list_price)
        FROM
            production.products p2
        WHERE
            p2.category_id = p1.category_id
        GROUP BY
            p2.category_id
    )
ORDER BY
    category_id,
    product_name;
```

# Correlated Subqueries: Example

The following example finds the products whose list price is equal to the highest list price of the products within the same category:

```
SELECT
    product_name,
    list_price,
    category_id
FROM
    production.products p1
WHERE
    list_price IN (
        SELECT
            MAX (p2.list_price)
        FROM
            production.products p2
        WHERE
            p2.category_id = p1.category_id
        GROUP BY
            p2.category_id
    )
ORDER BY
    category_id,
    product_name;
```

**Output**

| | product_name | list_price | category_id |
|---|---|---|---|
| 1 | Electra Straight 8 3i (20-inch) - Boy's - 2017 | 489.99 | 1 |
| 2 | Electra Townie 3i EQ (20-inch) - Boys' - 2017 | 489.99 | 1 |
| 3 | Trek Superfly 24 - 2017/2018 | 489.99 | 1 |
| 4 | Electra Townie Go! 8i - 2017/2018 | 2599.99 | 2 |
| 5 | Electra Townie Commute Go! - 2018 | 2999.99 | 3 |
| 6 | Electra Townie Commute Go! Ladies' - 2018 | 2999.99 | 3 |
| 7 | Trek Boone 7 Disc - 2018 | 3999.99 | 4 |
| 8 | Trek Powerfly 7 FS - 2018 | 4999.99 | 5 |
| 9 | Trek Powerfly 8 FS Plus - 2017 | 4999.99 | 5 |
| 10 | Trek Super Commuter+ 8S - 2018 | 4999.99 | 5 |
| 11 | Trek Fuel EX 9.8 27.5 Plus - 2017 | 5299.99 | 6 |
| 12 | Trek Remedy 9.8 - 2017 | 5299.99 | 6 |
| 13 | Trek Domane SLR 9 Disc - 2018 | 11999.99 | 7 |

# Correlated Subqueries: Example

For each product evaluated by the outer query, the subquery finds the highest price of all products in its category.

```
SELECT
    product_name,
    list_price,
    category_id
FROM
    production.products p1
WHERE
    list_price IN (
        SELECT
            MAX (p2.list_price)
        FROM
            production.products p2
        WHERE
            p2.category_id = p1.category_id
        GROUP BY
            p2.category_id
    )
ORDER BY
    category_id,
    product_name;
```

**Output**

| | product_name | list_price | category_id |
|---|---|---|---|
| 1 | Electra Straight 8 3i (20-inch) - Boy's - 2017 | 489.99 | 1 |
| 2 | Electra Townie 3i EQ (20-inch) - Boys' - 2017 | 489.99 | 1 |
| 3 | Trek Superfly 24 - 2017/2018 | 489.99 | 1 |
| 4 | Electra Townie Go! 8i - 2017/2018 | 2599.99 | 2 |
| 5 | Electra Townie Commute Go! - 2018 | 2999.99 | 3 |
| 6 | Electra Townie Commute Go! Ladies' - 2018 | 2999.99 | 3 |
| 7 | Trek Boone 7 Disc - 2018 | 3999.99 | 4 |
| 8 | Trek Powerfly 7 FS - 2018 | 4999.99 | 5 |
| 9 | Trek Powerfly 8 FS Plus - 2017 | 4999.99 | 5 |
| 10 | Trek Super Commuter+ 8S - 2018 | 4999.99 | 5 |
| 11 | Trek Fuel EX 9.8 27.5 Plus - 2017 | 5299.99 | 6 |
| 12 | Trek Remedy 9.8 - 2017 | 5299.99 | 6 |
| 13 | Trek Domane SLR 9 Disc - 2018 | 11999.99 | 7 |

# Correlated Subqueries: Example

If the price of the current product is equal to the highest price of all products in its category, the product is included in the result set. This process continues for the next product and so on.

```
SELECT
    product_name,
    list_price,
    category_id
FROM
    production.products p1
WHERE
    list_price IN (
        SELECT
            MAX (p2.list_price)
        FROM
            production.products p2
        WHERE
            p2.category_id = p1.category_id
        GROUP BY
            p2.category_id
    )
ORDER BY
    category_id,
    product_name;
```

**Output**

| | product_name | list_price | category_id |
|---|---|---|---|
| 1 | Electra Straight 8 3i (20-inch) - Boy's - 2017 | 489.99 | 1 |
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| 13 | Trek Domane SLR 9 Disc - 2018 | 11999.99 | 7 |

# Exists

**Exists**

The EXISTS operator is a logical operator that allows you to check whether a subquery returns any row.

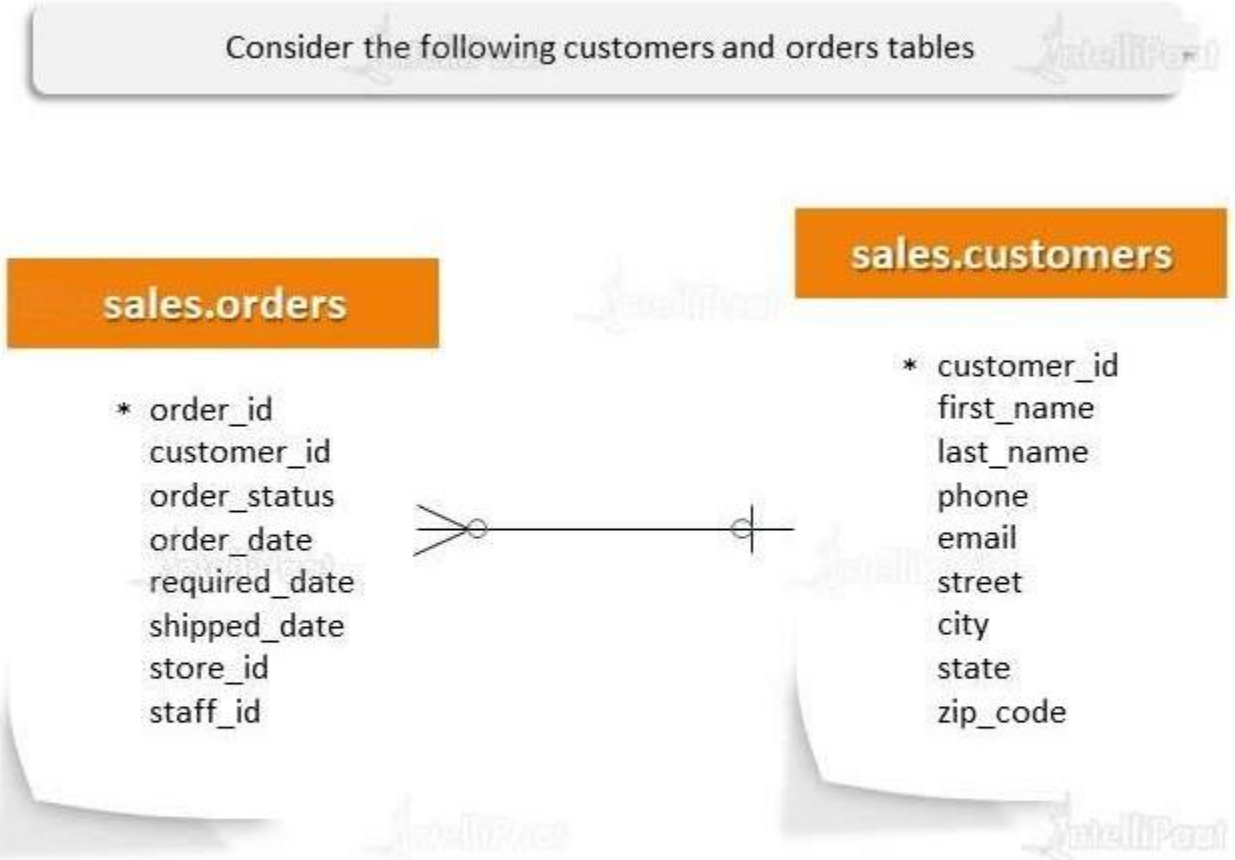
The EXISTS operator returns TRUE if the subquery returns one or more rows.

```
Syntax:  EXISTS(subquery)
```

**NOTE**

In this syntax, the subquery is a SELECT statement only. As soon as the subquery returns rows, the EXISTS operator returns TRUE and stop processing immediately. Though the subquery returns a NULL value, the EXISTS operator is still evaluated to TRUE.

# Using EXISTS with a correlated query



# Using EXISTS with a correlated query

This following example finds all customers who have placed more than two orders

```
SELECT
    customer_id,
    first_name,
    last_name
FROM
    sales.customers c
WHERE
    EXISTS (
        SELECT
            COUNT (*)
        FROM
            sales.orders o
        WHERE
            customer_id = c.customer_id
        GROUP BY
            customer_id
        HAVING
            COUNT (*) > 2
    )
ORDER BY
    first_name,
    last_name;
```

# Using EXISTS with a correlated query

This following example finds all customers who have placed more than two orders

```
SELECT
    customer_id,
    first_name,
    last_name
FROM
    sales.customers c
WHERE
    EXISTS (
        SELECT
            COUNT (*)
        FROM
            sales.orders o
        WHERE
            customer_id = c.customer_id
        GROUP BY
            customer_id
        HAVING
            COUNT (*) > 2
    )
ORDER BY
    first_name,
    last_name;
```

**Output**

| | customer_id | first_name | last_name |
|---|---|---|---|
| 1 | 20 | Aleta | Shepard |
| 2 | 32 | Araceli | Golden |
| 3 | 64 | Bobbie | Foster |
| 4 | 47 | Bridgette | Guerra |
| 5 | 17 | Caren | Stephens |
| 6 | 5 | Charolette | Rice |
| 7 | 50 | Cleotilde | Booth |
| 8 | 24 | Corene | Wall |
| 9 | 4 | Daryl | Spence |
| 10 | 1 | Debra | Burks |
| 11 | 33 | Deloris | Burke |
| 12 | 11 | Deshawn | Mendoza |
| 13 | 61 | Elinore | Aguilar |
| 14 | 16 | Emmitt | Sanchez |
| 15 | 14 | Garry | Espinoza |
| 16 | 9 | Genoveva | Baldwin |
| 17 | 18 | Georgetta | Hardin |
| 18 | 8 | Jacquline | Duncan |
| 19 | 30 | Jamaal | Albert |

# VIEW

**View** is a virtual table based on the result of an SQL statement.

| e_id | e_name | e_salary | e_age | e_gender | e_dept |
|---|---|---|---|---|---|
| 1 | Sam | 95000 | 45 | Male | Operations |
| 2 | Bob | 80000 | 21 | Male | Support |
| 3 | Anne | 125000 | 25 | Female | Analytics |
| 4 | Julia | 73000 | 30 | Female | Analytics |
| 5 | Matt | 159000 | 33 | Male | Sales |
| 6 | Jeff | 112000 | 27 | Male | Operations |

Employee Table



| | e_id | e_name | e_salary | e_age | e_gender | e_dept |
|---|---|---|---|---|---|---|
| 1 | 3 | Anne | 125000 | 25 | Female | Analytics |
| 2 | 4 | Julia | 112000 | 30 | Male | Analytics |

"Female_Employee" View

# VIEW


```
CREATE VIEW view_name
AS
SELECT column1, column2,..
FROM table_name
WHERE condition;
```

# VIEW

The views are generally referred to as a virtual table. It is just like a real table.

**Create a view to include the Store_Status column.**

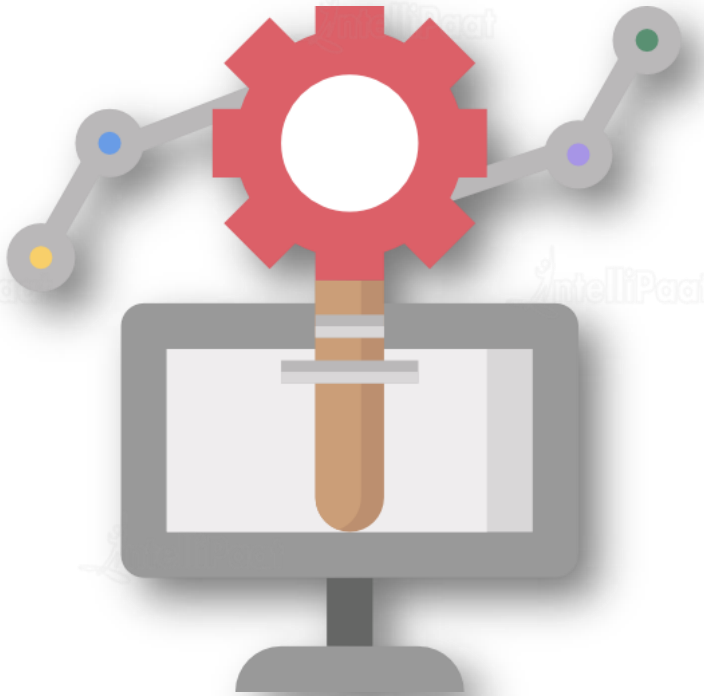
```
create view Store_Status_View as
Select *, IIF(IsHoliday ='TRUE',
'Open','Closed') as Store_Status
from Sales
```

Results | Messages

| | Store | Dept | Date | Weekly_Sales | IsHoliday | Store_Status |
|---|---|---|---|---|---|---|
| 1 | 8 | 5 | 05/08/2011 | 16183.33 | FALSE | Closed |
| 2 | 8 | 5 | 12/08/2011 | 16067.32 | FALSE | Closed |
| 3 | 8 | 5 | 19/08/2011 | 15966.62 | FALSE | Closed |
| 4 | 8 | 5 | 26/08/2011 | 11533.31 | FALSE | Closed |
| 5 | 8 | 5 | 02/09/2011 | 13594.54 | FALSE | Closed |
| 6 | 8 | 5 | 09/09/2011 | 12781.84 | TRUE | Open |
| 7 | 8 | 5 | 16/09/2011 | 15666.95 | FALSE | Closed |
| 8 | 8 | 5 | 23/09/2011 | 15107.2 | FALSE | Closed |
| 9 | 8 | 5 | 30/09/2011 | 16594.95 | FALSE | Closed |
| 10 | 8 | 5 | 07/10/2011 | 22372.88 | FALSE | Closed |
| 11 | 8 | 5 | 14/10/2011 | 18907.09 | FALSE | Closed |

# STORED PROCEDURE

STORED PROCEDURE is a prepared SQL code which can be saved and reused.



# Stored Procedure without Parameter: Syntax


```
CREATE PROCEDURE procedure_name
AS
sql_statement
GO;
```

↓

```
EXEC procedure_name
```

# STORED PROCEDURE

The Stored Procedure can be created once and re-used many times The Stored Procedure will also accept the parameters

Create a Stored Procedure to estimate the 10% increase in fuel price.

```
// Stored Procedure Creation without Parameter
CREATE PROCEDURE Proc_Fuel_Price as
Select Fuel_Price,
Fuel_Price+(Fuel_Price + 10)/100 as Estimate_Increase
from Features

// Calling Stored Procedure
Exec Proc_Fuel_Price
```

| Fuel_Price | Estimate_Increase |
|---|---|
| 2.57200002670288 | 2.69772002696991 |
| 2.54800009727478 | 2.67348009824753 |
| 2.51399993896484 | 2.63913993835449 |
| 2.56100010871887 | 2.68661010980606 |
| 2.625 | 2.75125 |
| 2.66700005531311 | 2.79367005586624 |
| 2.72000002861023 | 2.84720002889633 |
| 2.73200011253357 | 2.8593201136589 |

# Stored Procedure with Parameter: Syntax


```
CREATE PROCEDURE procedure_name
@param1 data-type, @param2 data-type
AS
sql_statement
GO;
```

# STORED PROCEDURE

Create a Stored Procedure to check whether the Weekly_Sales is greater than the user's Sales value.

```
// Stored Procedure Creation with Parameter (with float data type)
CREATE PROCEDURE Proc_Weekly_Sales
@Sales float as
Select Date,Weekly_Sales from Sales
Where Weekly_Sales > @Sales
// Calling Stored ProcedureExec
Proc_Weekly_Sales @Sales = 1500
```

Results | Messages

| | Date | Weekly_Sales |
|---|---|---|
| 1 | 05/08/2011 | 16183.33 |
| 2 | 12/08/2011 | 16067.32 |
| 3 | 19/08/2011 | 15966.62 |
| 4 | 26/08/2011 | 11533.31 |
| 5 | 02/09/2011 | 13594.54 |
| 6 | 09/09/2011 | 12781.84 |
| 7 | 16/09/2011 | 15666.95 |
| 8 | 23/09/2011 | 15107.2 |
| 9 | 30/09/2011 | 16594.95 |
| 10 | 07/10/2011 | 22372.88 |
| 11 | 14/10/2011 | 18907.09 |

# STORED PROCEDURE

Create a Stored Procedure to fetch the Store details based on the Storetype.

```
// Stored Procedure Creation with Parameter (with varchar data type)
CREATE PROCEDURE Proc_Type @type varchar(10) as
Select * from Stores
where Type=@type
// Calling Stored ProcedureExecExec Proc_Type @type ='C'
```

Results | Messages

| | Store | Type | Size |
|---|---|---|---|
| 1 | 30 | C | 42988 |
| 2 | 37 | C | 39910 |
| 3 | 38 | C | 39690 |
| 4 | 42 | C | 39690 |
| 5 | 43 | C | 41062 |
| 6 | 44 | C | 39910 |

# Transactions in SQL

Transaction is a group of commands that change the data stored in a database.

```
begin try
  begin transaction
        update employee set
e_salary=50 where
e_gender='Male'
        update employee set
e_salary=195/0 where
        e_name='Female'
        commit transaction
  Print 'transaction committed'
end try
begin
catch
  rollback transaction
        print 'transaction
rolledback' end catch
```

# Transactions in SQL

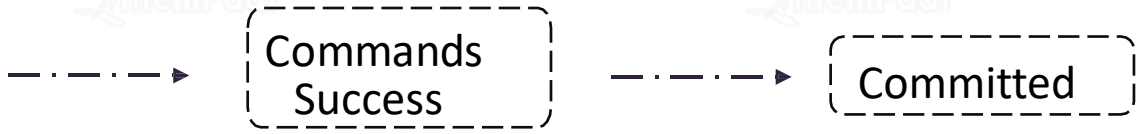
Transaction is a group of commands that change the data stored in a database.

```
begin try
  begin transaction
        update employee set
e_salary=50 where
e_gender='Male'
        update employee set
e_salary=195/0 where
e_name='Female'
        commit
  transaction  Print
  'transaction
  committed'
end try
begin
catch
  rollback transaction
        print 'transaction
rolledback' end catch
```

# Transactions in SQL

Transaction is a group of commands that change the data stored in a database.

```
begin try
  begin transaction
        update employee
set  e_salary=50 where
e_gender='Male'
        update employee set
e_salary=195 where
        e_name='Female'
        commit transaction
  Print 'transaction
  committed'
end try
begin
catch
  rollback transaction
        print 'transaction
rolledback'  end catch
```



# TRANSACTION

A Transaction is an action which can be performed to make one or more changes to the database.
The transaction can take DML commands (Insert, Update and Delete)

Create a transaction to update your Feature table and save it.

```
// Transaction to update a record
begin transaction Update_Features
update Features
set MarkDown1='No Data',MarkDown2='No Data',MarkDown3='No Data',
MarkDown4='No Data', MarkDown5='No Data'
 // Commit Transaction  (Saving the update)
commit transaction Update_Features
Select * from Features
```

# TRANSACTION

OUTPUT

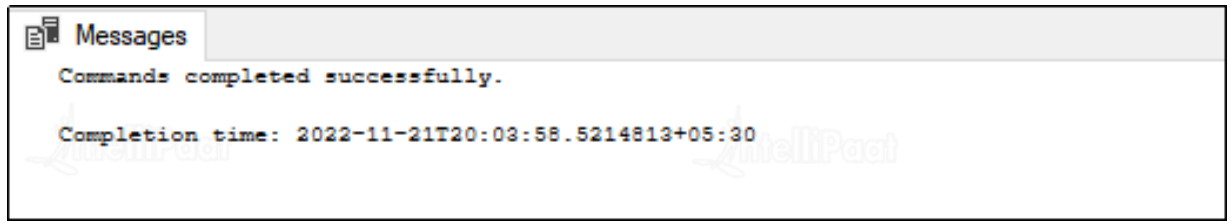
Results | Messages

| | Store | Date | Temperature | Fuel_Price | MarkDown1 | MarkDown2 | MarkDown3 | MarkDown4 | MarkDown5 | CPI | Unemployment | IsHoliday |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 05/02/2010 | 42.31 | 2.572 | No Data | No Data | No Data | No Data | No Data | 211.0963582 | 8.106 | FALSE |
| 2 | 1 | 12/02/2010 | 38.51 | 2.548 | No Data | No Data | No Data | No Data | No Data | 211.2421698 | 8.106 | TRUE |
| 3 | 1 | 19/02/2010 | 39.93 | 2.514 | No Data | No Data | No Data | No Data | No Data | 211.2891429 | 8.106 | FALSE |
| 4 | 1 | 26/02/2010 | 46.63 | 2.561 | No Data | No Data | No Data | No Data | No Data | 211.3196429 | 8.106 | FALSE |
| 5 | 1 | 05/03/2010 | 46.5 | 2.625 | No Data | No Data | No Data | No Data | No Data | 211.3501429 | 8.106 | FALSE |
| 6 | 1 | 12/03/2010 | 57.79 | 2.667 | No Data | No Data | No Data | No Data | No Data | 211.3806429 | 8.106 | FALSE |
| 7 | 1 | 19/03/2010 | 54.58 | 2.72 | No Data | No Data | No Data | No Data | No Data | 211.215635 | 8.106 | FALSE |
| 8 | 1 | 26/03/2010 | 51.45 | 2.732 | No Data | No Data | No Data | No Data | No Data | 211.0180424 | 8.106 | FALSE |
| 9 | 1 | 02/04/2010 | 62.27 | 2.719 | No Data | No Data | No Data | No Data | No Data | 210.8204499 | 7.808 | FALSE |
| 10 | 1 | 09/04/2010 | 65.86 | 2.77 | No Data | No Data | No Data | No Data | No Data | 210.6228574 | 7.808 | FALSE |
| 11 | 1 | 16/04/2010 | 66.32 | 2.808 | No Data | No Data | No Data | No Data | No Data | 210.4887 | 7.808 | FALSE |
| 12 | 1 | 23/04/2010 | 64.84 | 2.795 | No Data | No Data | No Data | No Data | No Data | 210.4391228 | 7.808 | FALSE |

# TRANSACTION

Create a transaction to roll back the changes.

```
// Transaction to Delete a record
 begin transaction Delete_Stores
 Delete Stores where Type='A'
  // Rollback Transaction (Undoing the deletion)
 rollback transaction Delete_Stores
Select * from Features
```



# SAVEPOINT

A Savepoint is like a marker. It saves a particular portion of a transaction without rolling the entire transaction.

Create a transaction to update your Feature table and save it.

**Before Rollback**

```
begin transaction Insert_Stores
Insert into Stores values (4,'C',35677)
Save transaction First_Record
Insert into Stores values (5,'D',55751)
Select * from stores
```

| | Store | Type | Size |
|---|---|---|---|
| 1 | 4 | C | 35677 |
| 2 | 5 | D | 55751 |
| 3 | 3 | B | 37392 |
| 4 | 7 | B | 70713 |
| 5 | 9 | B | 125833 |
| 6 | 10 | B | 126512 |
| 7 | 12 | B | 112238 |
| 8 | 15 | B | 123737 |
| 9 | 16 | B | 57197 |
| 10 | 17 | B | 93188 |
| 11 | 18 | B | 120653 |
| 12 | 21 | B | 140167 |
| 13 | 22 | B | 119557 |

# SAVEPOINT

**After Rollback** - (The (5,'D',55751) record was removed and the first record was saved)

```
rollback transaction First_Record
select * from stores
```

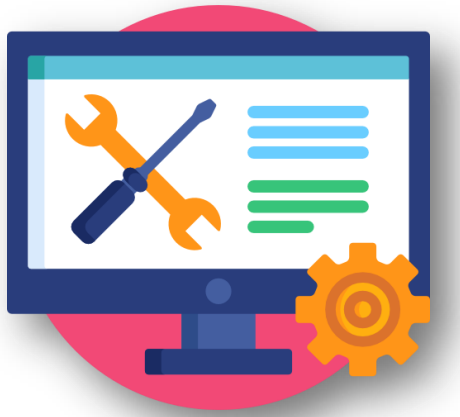
| | Store | Type | Size |
|---|---|---|---|
| 1 | 4 | C | 35677 |
| 2 | 3 | B | 37392 |
| 3 | 7 | B | 70713 |
| 4 | 9 | B | 125833 |
| 5 | 10 | B | 126512 |
| 6 | 12 | B | 112238 |
| 7 | 15 | B | 123737 |
| 8 | 16 | B | 57197 |
| 9 | 17 | B | 93188 |
| 10 | 18 | B | 120653 |
| 11 | 21 | B | 140167 |
| 12 | 22 | B | 119557 |
| 13 | 23 | B | 114533 |

# Exception Handling

An error condition during a program execution is called an exception.

The mechanism for resolving such an exception is exception handling.


Exception



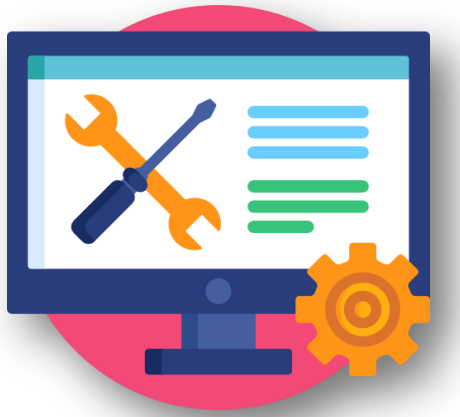
Exception Handling

# Exception Handling

An error condition during a program execution is called an exception.

The mechanism for resolving such an exception is exception handling.

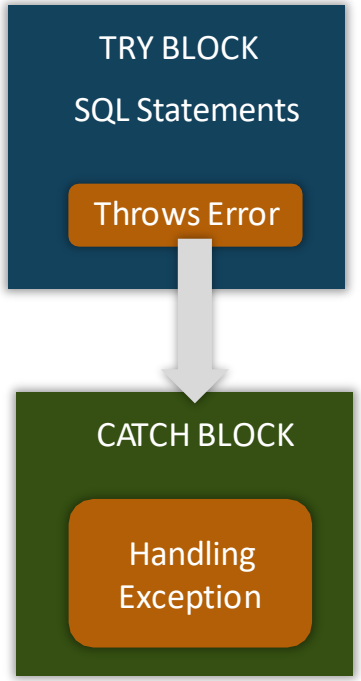

Exception



Exception Handling

# Try/Catch

SQL provides try/catch blocks for exception handling.



# Try/Catch: Syntax

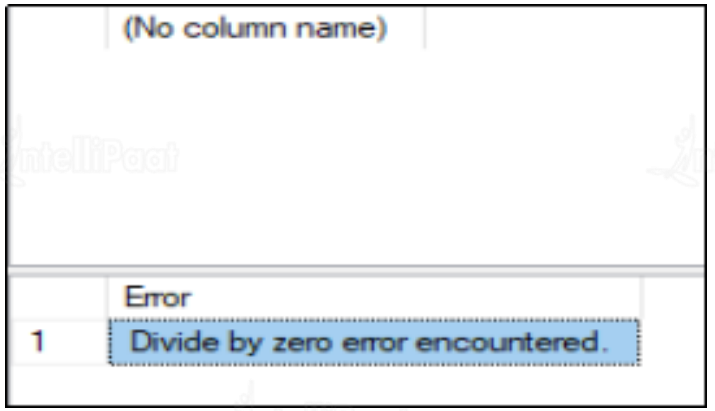

```
BEGIN TRY

SQL Statements

END TRY

BEGIN CATCH

- Print Error OR
- Rollback Transaction

END CATCH
```

# EXCEPTION HANDLING IN TRANSACTION

In the transaction, if the try blocks execute, the record will be automatically committed. If the catch blocks execute the record will be rolled back.

Create a transaction to divide the Weekly_Sales column by zero. Use the exception-handling method

```
begin transaction Sales_Division
  begin try
Select (Weekly_Sales)/0 from Sales
  end try
  begin catch
Select ERROR_MESSAGE()as Error
  end catch
// The Transaction will be rolled back
since we cannot divide Weekly_Sales by 0.
```



| | (No column name) |
|---|---|
| | Error |
| 1 | Divide by zero error encountered. |

# EXCEPTION HANDLING IN TRANSACTION

Create a transaction to divide the Weekly_Sales column by five. Use the exception-handling method.

```
begin transaction Sales_Division
  begin try
Select *,(Weekly_Sales)/5 as
 New_Weekly_Sales from Sales
  end try
  begin catch
Select ERROR_MESSAGE()as Error
  end catch
// The Transaction will be committed since
 we can divide a Weekly_Sales by 5.
```

| | Store | Dept | Date | Weekly_Sales | IsHoliday | New_Weekly_Sales |
|---|---|---|---|---|---|---|
| 1 | 8 | 5 | 05/08/2011 | 16183.33 | FALSE | 3236.666 |
| 2 | 8 | 5 | 12/08/2011 | 16067.32 | FALSE | 3213.464 |
| 3 | 8 | 5 | 19/08/2011 | 15966.62 | FALSE | 3193.324 |
| 4 | 8 | 5 | 26/08/2011 | 11533.31 | FALSE | 2306.662 |
| 5 | 8 | 5 | 02/09/2011 | 13594.54 | FALSE | 2718.908 |
| 6 | 8 | 5 | 09/09/2011 | 12781.84 | TRUE | 2556.368 |
| 7 | 8 | 5 | 16/09/2011 | 15666.95 | FALSE | 3133.39 |
| 8 | 8 | 5 | 23/09/2011 | 15107.2 | FALSE | 3021.44 |
| 9 | 8 | 5 | 30/09/2011 | 16594.95 | FALSE | 3318.99 |
| 10 | 8 | 5 | 07/10/2011 | 22372.88 | FALSE | 4474.576 |
| 11 | 8 | 5 | 14/10/2011 | 18907.09 | FALSE | 3781.418 |

# ROLLUP

**ROLLUP**

ROLLUP is a subclause of the GROUP BY clause which provides a shorthand for defining multiple grouping sets. Unlike the CUBE subclause, ROLLUP does not create all possible grouping sets based on the dimension columns

Let's consider an example. The following `CUBE (d1,d2,d3)` defines eight possible grouping sets:

```
(d1, d2, d3)
(d1, d2)
(d2, d3)
(d1, d3)
(d1)
(d2)
(d3)
()
```

# ROLLUP

**ROLLUP**

ROLLUP is a subclause of the GROUP BY clause which provides a shorthand for defining multiple grouping sets. Unlike the CUBE subclause, ROLLUP does not create all possible grouping sets based on the dimension columns

And the `ROLLUP(d1,d2,d3)` creates only four grouping sets, assuming the hierarchy d1 > d2 > d3, as follows:

```
(d1, d2, d3)
(d1, d2)
(d1)
()
```

# ROLLUP

**ROLLUP**

ROLLUP is a subclause of the GROUP BY clause which provides a shorthand for defining multiple grouping sets. Unlike the CUBE subclause, ROLLUP does not create all possible grouping sets based on the dimension columns

The ROLLUP is commonly used to calculate the aggregates of hierarchical data such as sales by year > quarter > month.

# ROLLUP

**ROLLUP**

ROLLUP is a subclause of the GROUP BY clause which provides a shorthand for defining multiple grouping sets. Unlike the CUBE subclause, ROLLUP does not create all possible grouping sets based on the dimension columns

**Syntax**

```
SELECT
    d1,
    d2,
    d3,
    aggregate_function(c4)
FROM
    table_name
GROUP BY
    ROLLUP (d1, d2, d3);
```

In this syntax, d1, d2, and d3 are the dimension columns. The statement will calculate the aggregation of values in the column c4 based on the hierarchy d1 > d2 > d3.

# ROLLUP

**ROLLUP**

ROLLUP is a subclause of the GROUP BY clause which provides a shorthand for defining multiple grouping sets. Unlike the CUBE subclause, ROLLUP does not create all possible grouping sets based on the dimension columns

**Syntax**

```
SELECT
    d1,
    d2,
    d3,
    aggregate_function(c4)
FROM
    table_name
GROUP BY
    d1,
    ROLLUP (d2, d3);
```

You can also do a partial roll up to reduce the subtotals generated by using the following syntax

# ROLLUP

SQL Roll up will generate multiple grouping sets. Roll-up can be used along with the group by function.

Give the total weekly sales value with the Date and Dept details. Use roll-up to pull the data in hierarchical order.

```
Select Date, Dept,
SUM(Weekly_Sales)as Total_Sale from
Sales
group by Date, Dept
with Rollup
```

Results | Messages

| | Date | Dept | Total_Sale |
|---|---|---|---|
| 1 | 01/04/2011 | 1 | 781166.1 |
| 2 | 01/04/2011 | 2 | 1875748.52 |
| 3 | 01/04/2011 | 3 | 348184.67 |
| 4 | 01/04/2011 | 4 | 1090598.68 |
| 5 | 01/04/2011 | 5 | 951711.6 |
| 6 | 01/04/2011 | 6 | 169476.42 |
| 7 | 01/04/2011 | 7 | 792626.93 |
| 8 | 01/04/2011 | 8 | 1320036.89 |
| 9 | 01/04/2011 | 9 | 750923.96 |
| 10 | 01/04/2011 | 10 | 744930.9 |
| 11 | 01/04/2011 | 11 | 510298.05 |

Results | Messages

| | Date | Dept | Total_Sale |
|---|---|---|---|
| 2... | 09/04/2010 | 1 | 1518946.82 |
| 2... | 09/04/2010 | 2 | 1903127.59 |
| 2... | 09/04/2010 | 3 | 363798.86 |
| 2... | 09/04/2010 | 4 | 1118048.3 |
| 2... | 09/04/2010 | 5 | 966470.35 |
| 2... | 09/04/2010 | 6 | 206312.51 |
| 2... | 09/04/2010 | 7 | 1095585.56 |
| 2... | 09/04/2010 | 8 | 1314310.42 |
| 2... | 09/04/2010 | 9 | 903029.69 |
| 2... | 09/04/2010 | 10 | 808857.42 |
| 2... | 09/04/2010 | 11 | 608841.17 |

# Triggers

A trigger is a special kind of stored procedure that automatically executes when an event occurs in the database server. **DML** triggers execute when a user tries to modify data through a data manipulation language (DML) event. DML events are **INSERT**, **UPDATE**, or **DELETE** statements on a table or view

## CREATE TRIGGER Statement

The **CREATE TRIGGER** statement defines a trigger in the database.

## Authorization

The privileges held by the authorization ID of the statement must include at least one of the following:

- **ALTER** privilege on the table on which the **BEFORE** or **AFTER** trigger is defined
- **CONTROL** privilege on the view on which the **INSTEAD OF TRIGGER** is defined
- Definer of the view on which the **INSTEAD OF** trigger is defined
- **ALTERIN** privilege on the schema of the table or view on which the trigger is defined
- **SYSADM** or **DBADM** authority and one of:
  - **IMPLICIT_SCHEMA** authority on the database, if the implicit or explicit schema name of the trigger does not exist
  - **CREATEIN** privilege on the schema, if the schema name of the trigger refers to an existing schema

# Types of Triggers

There are three main types of triggers that fire on:

- INSERT
- DELETE
- UPDATE

actions. Like stored procedures, these can also be encrypted for extra security.

# Types of Triggers

```
CREATE TRIGGER name ON table
  [WITH ENCRYPTION]
  [FOR/AFTER/INSTEAD OF]
  [INSERT, UPDATE, DELETE]
  [NOT FOR REPLICATION]
AS
BEGIN
--SQL statements
...
END
```


We have a table with some columns. Our goal is to create a TRIGGER which will be fired on every modification of data in each column and track the number of modifications of that column. The sample example is given below:

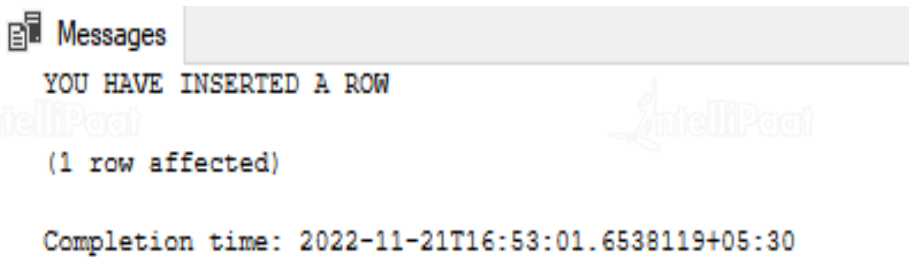
```
-- =============================================
-- Author: Md. Marufuzzaman
-- Create date:
-- Description: Alter count for any modification
-- =============================================
CREATE TRIGGER [TRIGGER_ALTER_COUNT] ON [dbo].[tblTriggerExample]
FOR INSERT, UPDATE
AS
BEGIN
DECLARE @TransID VARCHAR(36)
 SELECT @TransID = TransactionID FROM INSERTED
 UPDATE [dbo].[tblTriggerExample] SET AlterCount = AlterCount + 1
       ,LastUpdate = GETDATE()
   WHERE TransactionID = @TransID
END
```

# TRIGGERS

**DML Triggers:**
The DML Trigger performs an event in Insert, Update or Delete commands in a **table or view**.

Create an insert trigger for the Sales table

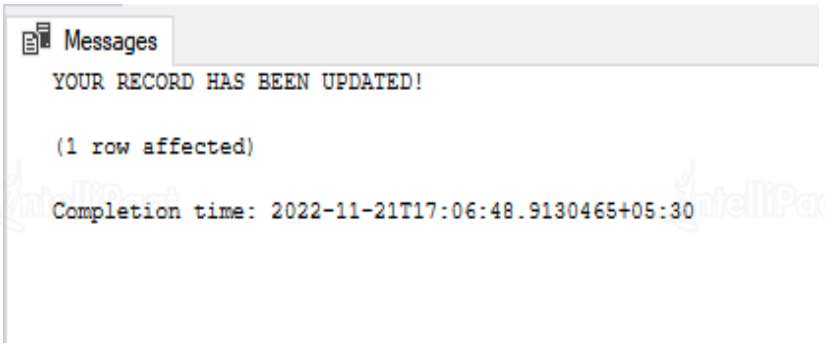
```
//Insert Trigger Creation
 create trigger trigger_insert on Sales
after insert
as begin
PRINT'YOU HAVE INSERTED A ROW'
end
 //To view the trigger activation
 insert into Sales values (9,4,'04-11-2012',15670.50,'FALSE')
```



# TRIGGERS

Create an update trigger in the Orders table.

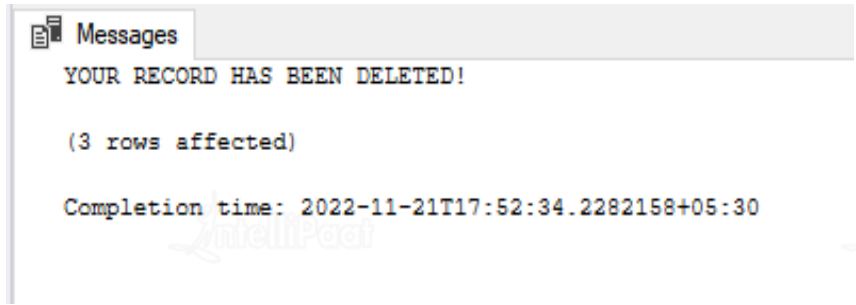
```
//Update Trigger Creation
 create trigger trigger_update on Stores
after update
as begin
PRINT'YOUR RECORD HAS BEEN UPDATED!'
end
SELECT * FROM [dbo].[Stores]
//To view the trigger activation
 UPDATE Stores set Type='A' where Store =1
```



# TRIGGERS

Create a delete trigger in the Orders table.

```
//Delete Trigger Creation
 create trigger trigger_delete on Features
after delete
as
begin
PRINT'YOUR RECORD HAS BEEN DELETED!'
end
select * from [dbo].[Features]
//To view the trigger activation
 delete Features where Temperature='38.51'
```



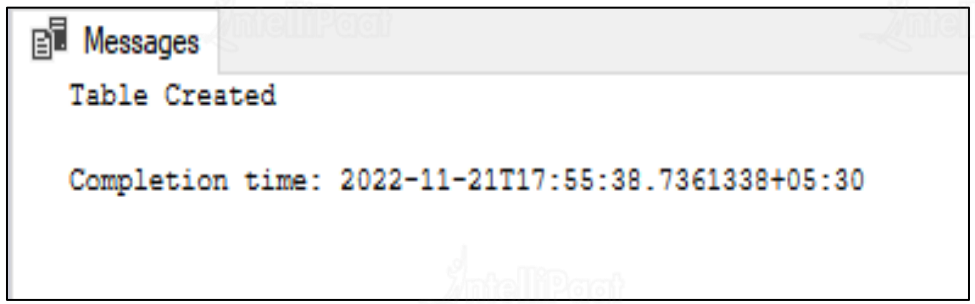
# TRIGGERS

**DDL Triggers:**

The DDL Trigger performs an event in Create, Alter or Drop commands in a database.

Create a create trigger for your database

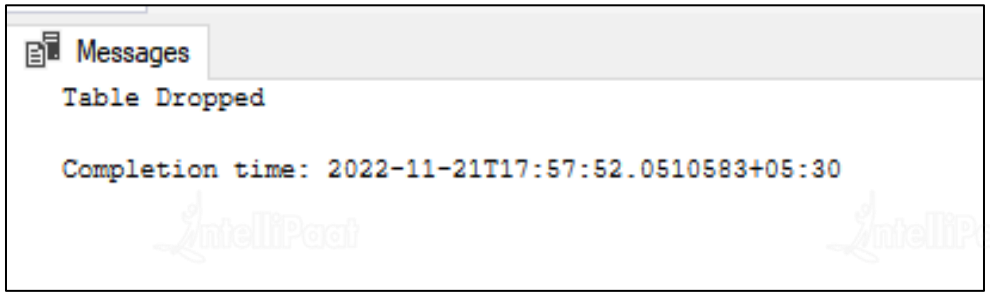
```
//Create Trigger Creation
create trigger create_trigger
on database
after create_table
as begin
Print 'Table Created‘
End
//To view the trigger activation
 create table sample_table (id int)
```



# TRIGGERS

Alter a create trigger from your database to drop trigger.

```
//Altering Create Trigger to Drop Trigger
alter trigger create_trigger
on database
after drop_table
as begin
Print 'Table Dropped'
End
//To view the trigger activation
 drop table sample_table
```



# TRIGGERS

Create a alter trigger for your database.

```
//Alter Trigger Creation
 create trigger alter_trigger
on database
after alter_table
as begin
Print 'Table Altered'
end
//To view the trigger activation
 alter table sample_table
 alter column id varchar(5)
```

# COALESCE( ) FUNCTION

Use Coalesce function and print the first value without NULL records.

**COALESCE()**
return the first non-null value in a list
**Syntax:**
*COALESCE(val1, val2, ….,val_n)*

```
select coalesce(NULL,NULL,'Intellipaat',NULL,NULL,'Waseem');
select coalesce('Shilpi',NULL,NULL,'Intellipaat',NULL);
```

| (No column name) |
| --- |
| Intellipaat |

| (No column name) |
| --- |
| Shilpi |

# COALESCE( ) FUNCTION

Create a function using coalesce to concat the Store_Location and City to form a Address column.

```
// Coalesce Creation
Create FUNCTION try_CoalesceConcat
(@city varchar(100))
RETURNS NVARCHAR(MAX)
AS
BEGIN
  DECLARE @str NVARCHAR(MAX);
  SELECT @str = COALESCE(@str + ', ', '')
+ Store_Location + City
    FROM Store_Details
                WHERE City = @city
                ORDER BY Store_Location;
  RETURN (@str);
END
```

Results | Messages

| | Store | Store_Name | Sales | Order_No | Store_Location | City | Pincode |
|---|---|---|---|---|---|---|---|
| 1 | 1 | Walmart | 374 | 246 | Bentonville, Ark | Montgomery | 36104 |
| 2 | 2 | The Kroger Co | 115 | 240 | Cincinnati | Juneau | 99801 |
| 3 | 3 | Costco | 93 | 567 | Issaquah, Wash | Phoenix | 85001 |
| 4 | 4 | The Home Depot | 91 | 639 | Atlanta | Little Rock | 72201 |
| 5 | 5 | Walgreens Boots Alliance | 82 | 484 | Deerfield, Ill | Sacramento | 95814 |
| 6 | 6 | CVS Health Corporation | 79 | 890 | Woonsocket, R.I | Denver | 80202 |
| 7 | 7 | Target | 71 | 251 | Minneapolis | Hartford | 6103 |
| 8 | 8 | Lowe Companies | 63 | 308 | Mooresville, N.C | Dover | 19901 |
| 9 | 9 | Albertsons Companies | 59 | 454 | Boise, Idaho | Tallahassee | 32301 |
| 10 | 10 | Royal Ahold Delhaize USA | 43 | 254 | Carlisle, Pa | Atlanta | 30303 |

Before Calling Coalesce function

# COALESCE( ) FUNCTION

**After Calling Coalesce function**

```
SELECT *, Address =
dbo.try_CoalesceConcat(City) FROM
Store_Details
```

Results | Messages

| | Store | Store_Name | Sales | Order_No | Store_Location | City | Pincode | Address |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | Walmart | 374 | 246 | Bentonville, Ark | Montgomery | 36104 | Bentonville, ArkMontgomery |
| 2 | 2 | The Kroger Co | 115 | 240 | Cincinnati | Juneau | 99801 | CincinnatiJuneau |
| 3 | 3 | Costco | 93 | 567 | Issaquah, Wash | Phoenix | 85001 | Issaquah, WashPhoenix |
| 4 | 4 | The Home Depot | 91 | 639 | Atlanta | Little Rock | 72201 | AtlantaLittle Rock |
| 5 | 5 | Walgreens Boots Alliance | 82 | 484 | Deerfield, Ill | Sacramento | 95814 | Deerfield, IllSacramento |
| 6 | 6 | CVS Health Corporation | 79 | 890 | Woonsocket, R.I | Denver | 80202 | Woonsocket, R.IDenver |
| 7 | 7 | Target | 71 | 251 | Minneapolis | Hartford | 6103 | MinneapolisHartford |
| 8 | 8 | Lowe Companies | 63 | 308 | Mooresville, N.C | Dover | 19901 | Mooresville, N.CDover |
| 9 | 9 | Albertsons Companies | 59 | 454 | Boise, Idaho | Tallahassee | 32301 | Boise, IdahoTallahassee |
| 10 | 10 | Royal Ahold Delhaize USA | 43 | 254 | Carlisle, Pa | Atlanta | 30303 | Carlisle, PaAtlanta |

# ISNULL( ) FUNCTION

Fetch the below Customer's name without null values.

Results | Messages

| | Id | First_Name | Last_Name | Age |
|---|---|---|---|---|
| 1 | 1 | Harper | NULL | 30 |
| 2 | 2 | NULL | Charlie | 31 |
| 3 | 3 | Jane | Jones | 25 |
| 4 | 4 | NULL | Henry | 27 |
| 5 | 5 | Tina | Luis | 24 |

```
Select ISNULL(First_Name, Last_Name)as
 Customer_Name from Customer
```

Results | Messages

| | Customer_Name |
|---|---|
| 1 | Harper |
| 2 | Charlie |
| 3 | Jane |
| 4 | Henry |
| 5 | Tina |

# CONVERT FUNCTION

It converts a value (of any type) into a specified datatype.

Convert the Weekly_Sales data type from float to int

**Syntax -**
*CONVERT(data_type, expression)*

```
select Weekly_Sales, convert
(int,Weekly_Sales) as
 Converted_Weekly_Sales from Sales
```

Results | Messages

| | Weekly_Sales | Converted_Weekly_Sales |
|---|---|---|
| 1 | 16183.33 | 16183 |
| 2 | 16067.32 | 16067 |
| 3 | 15966.62 | 15966 |
| 4 | 11533.31 | 11533 |
| 5 | 13594.54 | 13594 |
| 6 | 12781.84 | 12781 |
| 7 | 15666.95 | 15666 |
| 8 | 15107.2 | 15107 |
| 9 | 16594.95 | 16594 |

# Common Table Expression(CTE)

The Common Table Expressions (CTE) were introduced into standard SQL in order to simplify various classes of SQL Queries for which a derived table was just unsuitable.


```
SELECT * FROM ( SELECT A.Address, E.Name, E.Age
From Address A Inner join Employee E on E.EID =
A.EID) T
WHERE T.Age > 50 ORDER BY T.NAME
```

Continued.....

# Common Table Expression(CTE)

Which can be replaced by CTE (Common table Expression)

CTE allows you to define the subquery at once, name it using an alias and later call the same data using the alias just like what you do with a normal table.

```
With T(Address, Name, Age) --Column names for Temporary table
AS ( SELECT A.Address, E.Name, E.Age from Address A INNER JOIN
EMP E ON E.EID = A.EID )
SELECT * FROM T --SELECT or USE CTE temporary Table
WHERE T.Age > 50 ORDER BY T.NAME
```

# Multiple CTE

To use multiple CTE's in a single query you just need to finish the first CTE, add a comma, declare the name and optional columns for the next CTE, open the CTE query with a comma, write the query, and access it from a CTE query later in the same query or from the final query outside the CTEs.

```
With TI (Address, Name, Age) --Column names for Temporary table
AS ( SELECT A.Address, E.Name, E.Age from Address A INNER JOIN EMP E ON E.EID = A.EID )
T2(Name, Desig)
AS
( SELECT NAME, DESIG FROM Designation)
SELECT T1.*, T2.Desig FROM T1 --SELECT or USE CTE temporary Table WHERE T1.Age > 50 AND TI .Name = T2.Name
ORDER BY T1.NAME
WITH ShowMessage(STATEMENT, LENGTH)
AS
( SELECT STATEMENT = CAST('I Like ' AS VARCHAR(300)), LEN('I Like ')
UNION ALL
SELECT CAST(STATEMENT + 'CodeProject! ' AS VARCHAR(300))
, LEN(STATEMENT) FROM ShowMessage WHERE LENGTH < 300 )
SELECT STATEMENT, LENGTH FROM ShowMessage
```

# Common Table Expression(CTE)

CTE allows us to define a temporary result set, that can be linked immediately with the select, insert, update or delete statement.

Using CTE display the records of stores data where Type is C

**Syntax -**

*WITH expression_name(column1,column2,..)*
*AS (CTE_definition)*

```
with New_CTE
as(select * from stores_data where
Type='C'
)select * from new_CTE
```

| Store | Type | Size |
|---|---|---|
| 30 | C | 42988 |
| 37 | C | 39910 |
| 38 | C | 39690 |
| 42 | C | 39690 |
| 43 | C | 41062 |
| 44 | C | 39910 |

# Common Table Expression(CTE)

Create CTE with Store, Date and Fuel_Price column from features where holiday is there

```
// CTE with mutiple columns
with New_CTE(Store,Date,Fuel_Price)
 as
 (
 select Store,Date,Fuel_Price from
 features where isHoliday=1
 )
 select Store,Date,Fuel_Price from New_CTE
```

| Store | Date | Fuel_Price |
|---|---|---|
| 1 | 2010-12-02 | 2.54800009727478 |
| 1 | 2010-10-09 | 2.56500005722046 |
| 1 | 2010-11-26 | 2.73499989509583 |
| 1 | 2010-12-31 | 2.94300007820129 |
| 1 | 2011-11-02 | 3.022000743866 |
| 1 | 2011-09-09 | 3.5460000038147 |
| 1 | 2011-11-25 | 3.23600006103516 |
| 1 | 2011-12-30 | 3.12899994850159 |
| 1 | 2012-10-02 | 3.40899991989136 |
| 1 | 2012-07-09 | 3.73000001907349 |
| 1 | 2012-11-23 | 3.21099996566772 |

# Common Table Expression(CTE)

Insert a record using CTE in Store Details table

```
// Inserting a record
With New_CTE
 as
(
 select * from Store_Details
 )
 insert new_CTE values(1,'H and
 M',100,1072,'HSR','Bangalore','560101')
 select * from Store_Details
```

| Store | Store_Name | Sales | Order_No | Store_Location | City | pincode |
|---|---|---|---|---|---|---|
| 3 | Costco | 93 | 567 | Issaquah, Wash | Phoenix | 85001 |
| 4 | The Home Depot | 91 | 639 | Atlanta | Little Rock | 72201 |
| 5 | Walgreens Boots Alliance | 82 | 484 | Deerfield, Ill | Sacramento | 95814 |
| 6 | CVS Health Corporation | 79 | 890 | Woonsocket, R.I | Denver | 80202 |
| 8 | Lowe Companies | 63 | 308 | Mooresville, N.C | Dover | 19901 |
| 9 | Albertsons Companies | 59 | 454 | Boise, Idaho | Tallahassee | 32301 |
| 10 | Royal Ahold Delhaize USA | 43 | 254 | Carlisle, Pa | Atlanta | 30303 |

| Store | Store_Name | Sales | Order_No | Store_Location | City | pincode |
|---|---|---|---|---|---|---|
| 1 | H and M | 100 | 1072 | HSR | Bangalore | 560101 |
| 3 | Costco | 93 | 567 | Issaquah, Wash | Phoenix | 85001 |
| 4 | The Home Depot | 91 | 639 | Atlanta | Little Rock | 72201 |
| 5 | Walgreens Boots Alliance | 82 | 484 | Deerfield, Ill | Sacramento | 95814 |
| 6 | CVS Health Corporation | 79 | 890 | Woonsocket, R.I | Denver | 80202 |
| 8 | Lowe Companies | 63 | 308 | Mooresville, N.C | Dover | 19901 |
| 9 | Albertsons Companies | 59 | 454 | Boise, Idaho | Tallahassee | 32301 |
| 10 | Royal Ahold Delhaize USA | 43 | 254 | Carlisle, Pa | Atlanta | 30303 |

# Common Table Expression(CTE)

Update the store_name where store no is 1 using CTE in Store Details table

```
// Updating a record
With New_CTE
as
(
 select * from Store_Details
 )
 update new_CTE set store_name='Jack &
 Jones' where Store=1
 select * from Store_Details
```

| Store | Store_Name | Sales | Order_No | Store_Location | City | pincode |
|---|---|---|---|---|---|---|
| 1 | Jack & Jones | 100 | 1072 | HSR | Bangalore | 560101 |
| 3 | Costco | 93 | 567 | Issaquah, Wash | Phoenix | 85001 |
| 4 | The Home Depot | 91 | 639 | Atlanta | Little Rock | 72201 |
| 5 | Walgreens Boots Alliance | 82 | 484 | Deerfield, Ill | Sacramento | 95814 |
| 6 | CVS Health Corporation | 79 | 890 | Woonsocket, R.I | Denver | 80202 |
| 8 | Lowe Companies | 63 | 308 | Mooresville, N.C | Dover | 19901 |
| 9 | Albertsons Companies | 59 | 454 | Boise, Idaho | Tallahassee | 32301 |
| 10 | Royal Ahold Delhaize USA | 43 | 254 | Carlisle, Pa | Atlanta | 30303 |

# Common Table Expression(CTE)

Update the store_name where store no is 1 using CTE in Store Details table

```
// Deleting a  record
With New_CTE
as
(
 select * from Store_Details
 )
 delete new_CTE where Store=1
 select * from Store_Details
```

| Store | Store_Name | Sales | Order_No | Store_Location | City | pincode |
|---|---|---|---|---|---|---|
| 3 | Costco | 93 | 567 | Issaquah, Wash | Phoenix | 85001 |
| 4 | The Home Depot | 91 | 639 | Atlanta | Little Rock | 72201 |
| 5 | Walgreens Boots Alliance | 82 | 484 | Deerfield, Ill | Sacramento | 95814 |
| 6 | CVS Health Corporation | 79 | 890 | Woonsocket, R.I | Denver | 80202 |
| 8 | Lowe Companies | 63 | 308 | Mooresville, N.C | Dover | 19901 |
| 9 | Albertsons Companies | 59 | 454 | Boise, Idaho | Tallahassee | 32301 |
| 10 | Royal Ahold Delhaize USA | 43 | 254 | Carlisle, Pa | Atlanta | 30303 |