EXPLORE AI ACADEMY

Querying data

Logic operators

Logic operators

> Logic (or boolean) operators **combine**, **exclude**, or **negate conditions** in order to evaluate the overall truth of a condition or a set of conditions.

`AND` combines two conditions and is only **TRUE** if **both** conditions are **TRUE**.

`OR` combines two conditions and is only **TRUE** if **either** condition is **TRUE**.

`NOT` reverses the truth of a condition. **TRUE** becomes **FALSE** and **FALSE** becomes **TRUE**.

`IN` combines several **`OR`** operators. It returns **TRUE** if a value is within a list of possible values.

`BETWEEN` combines the **`>`** and **`<`** operators. It returns **TRUE** if a value is within a specified range.

`LIKE` matches a string to a pattern. It returns **TRUE** if a string matches the search pattern.

Logic operators

OR

The **OR** operator is used to filter records based on multiple conditions. If **at least one of the specified conditions** is **TRUE**, the record will be included in the results set.

Syntax: `… WHERE condition1 OR condition2;`

```
SELECT
    *
FROM
    db.Table_1
WHERE
    col2 >= 25
    OR col3 = “m”;
```

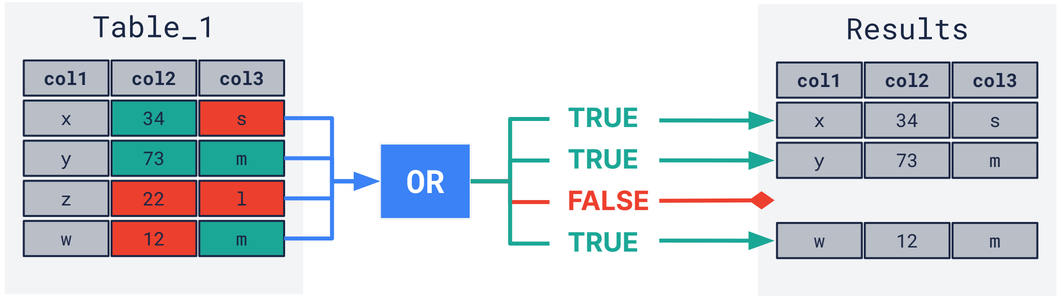


Table_1

col1	col2	col3
x	🟩 34	🟥 s
y	🟩 73	🟩 m
z	🟥 22	🟥 l
w	🟥 12	🟩 m

Results

col1	col2	col3
x	34	s
y	73	m
w	12	m

Rows that meet **any** of the conditions (`col2 ≥ 25` **or** `col3 = “m”`) are **included**.

Logic operators

Multiple OR conditions

OR

```
SELECT
    *
FROM
    db.Table_2
WHERE
    col1 = “car”    -- Condition 1
    OR col2 < 60    -- Condition 2
    OR col3 = “l”;  -- Condition 3
```

- More than two **OR** statements can be combined.
- Rows that meet **any** of the specified conditions are included.
- Rows are **included** in the results if `col1 = car` **or** when `col2 > 60` **or** `col3 = l`.

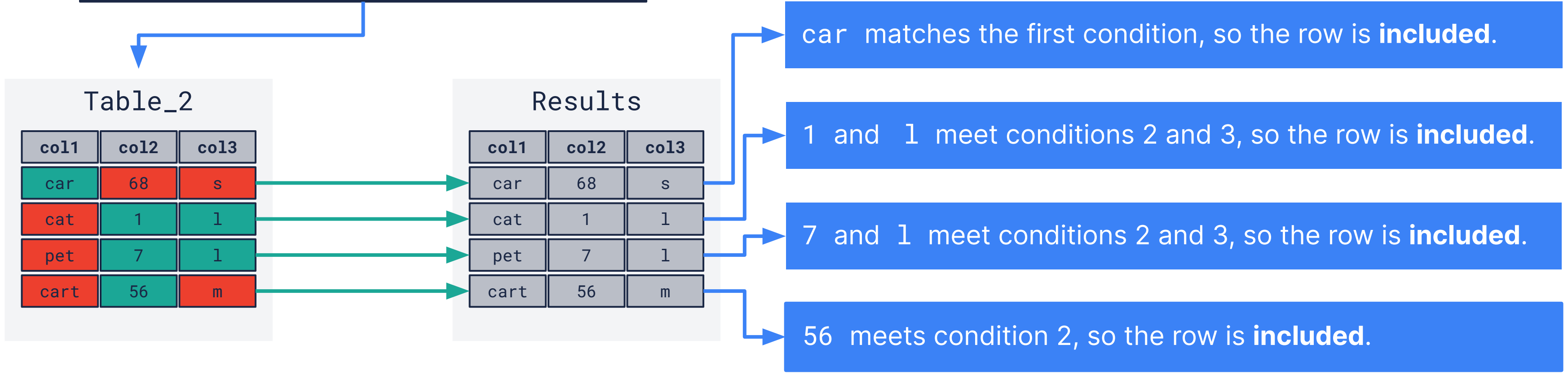


Table_2

col1	col2	col3
car	68	s
cat	1	l
pet	7	l
cart	56	m

Results

col1	col2	col3
car	68	s
cat	1	l
pet	7	l
cart	56	m

`car` matches the first condition, so the row is **included**.

`1` and `l` meet conditions 2 and 3, so the row is **included**.

`7` and `l` meet conditions 2 and 3, so the row is **included**.

`56` meets condition 2, so the row is **included**.

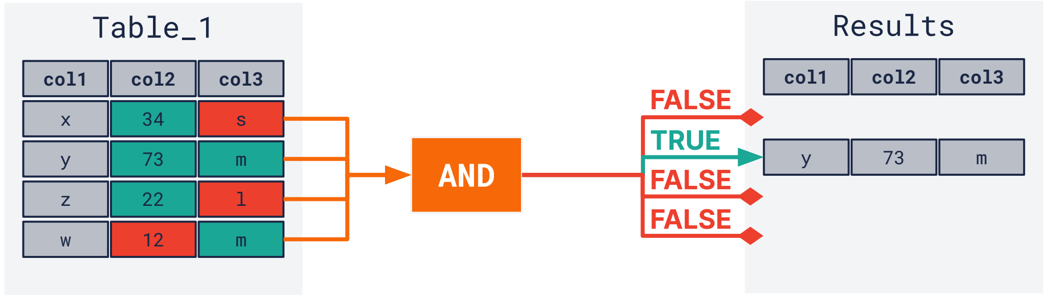
Logic operators

AND

The **AND** operator is used to filter records based on **more than one condition**. **All** conditions connected by an **AND** clause must be **TRUE** for the record to be included in the results.

Syntax: `… WHERE condition1 AND condition2;`

```
SELECT
    *
FROM
    db.Table_1
WHERE
    col2 >= 20
    AND col3 = “m”;
```



Only rows that are **TRUE** for **both** conditions (`col2 ≥ 20 AND col3 = “m”`) are included.

Logic operators

Multiple AND conditions

AND

```
SELECT
    *
FROM
    db.Table_2
WHERE
    col1 = “cat”      -- Condition 1
    AND col2 > 0      -- Condition 2
    AND col3 = “l”;   -- Condition 3
```

- More than two **AND** statements can be combined.
- Rows that meet **all** of the conditions are included.
- Rows are only **included** in the results if `col1 = cat` **and** `col2 > 0` **and** `col3 = l`.

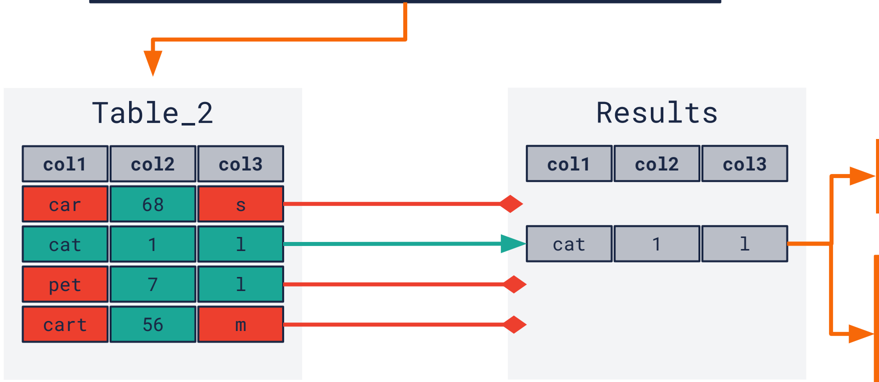


Table_2

col1	col2	col3
car	68	s
cat	1	l
pet	7	l
cart	56	m

Results

col1	col2	col3
cat	1	l

Only one row meets **all conditions**.

cat meets condition 1
AND 1 meets condition 2,
AND 1 meets condition 3, so the row is **included**.

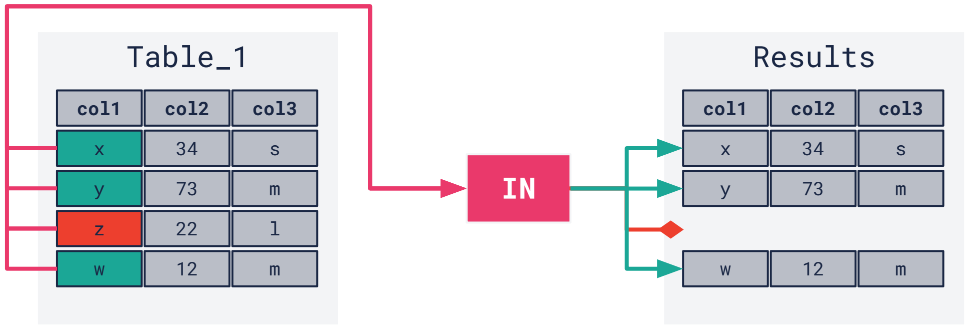
Logic operators

IN

IN is used to check if a value in a column matches any value in a list.

Syntax: `… WHERE col IN (value1, value2, ...);`

```
SELECT
    *
FROM
    db.Table_1
WHERE
    col1
IN(
    “w”,
    “x”,
    “y”
);
```



`col1 IN(“w”, “x”, ”y”)` is a shortcut for: `(col1 = “x” OR col1 = “y” OR col1 = “z”)`.

It is better to use **IN** when checking multiple **OR** statements.

Logic operators

BETWEEN

The **BETWEEN** operator is used to filter records within a specific **range**, **inclusive** of the range endpoints.

Syntax: `… WHERE col BETWEEN value1 AND value2;`

```
SELECT
    *
FROM
    db.Table_1
WHERE
    col2 BETWEEN 22 AND 50;
```

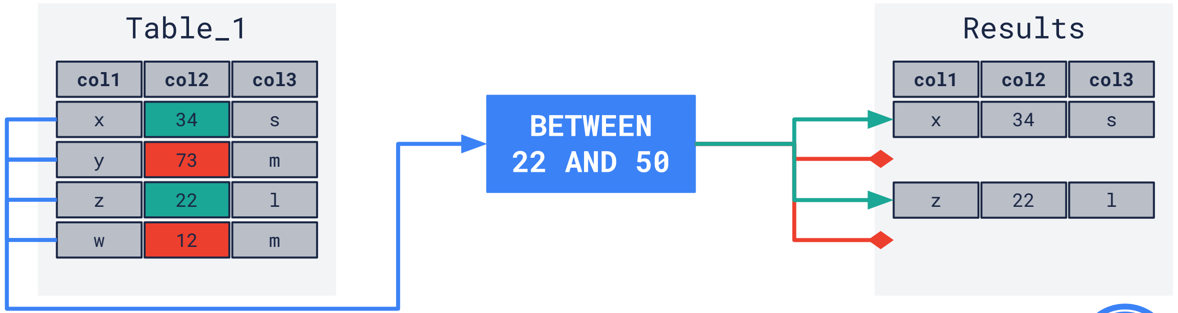


Table_1

col1	col2	col3
x	34	s
y	73	m
z	22	l
w	12	m

Results

col1	col2	col3
x	34	s
z	22	l

- Rows where `col2` is between `22` and `50` are **included**.
- Rows where `col2` is outside this range are **excluded**.

BETWEEN makes SQL code more reac so always try to use it when specifying ranges.

Logic operators

IS NULL

IS NULL is used to check whether a value is **NULL** or **missing**, essentially helping to identify gaps in the data.

Syntax: `… WHERE col IS NULL;`

```
SELECT
    *
FROM
    db.Table_3
WHERE
    col2 IS NULL;
```

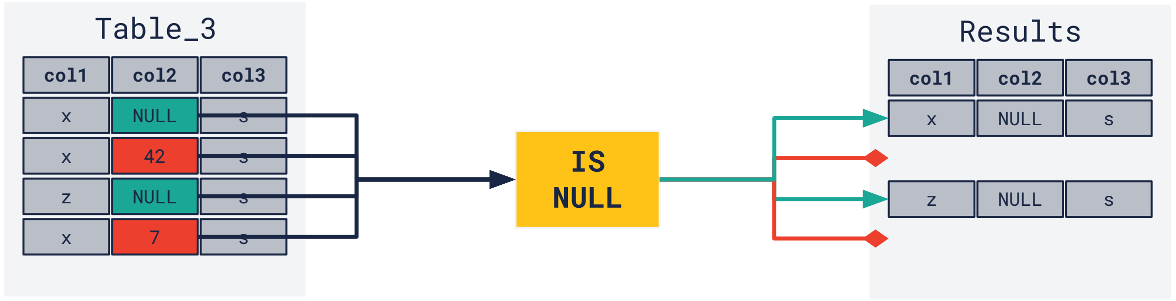


Table_3

col1	col2	col3
x	NULL	s
x	42	s
z	NULL	s
x	7	s

Results

col1	col2	col3
x	NULL	s
z	NULL	s

- **Includes** only rows where there are **NULL** values in the specified column.
- To check multiple columns for **NULL** values, we can use "**OR** `col3` **IS NULL**" etc.

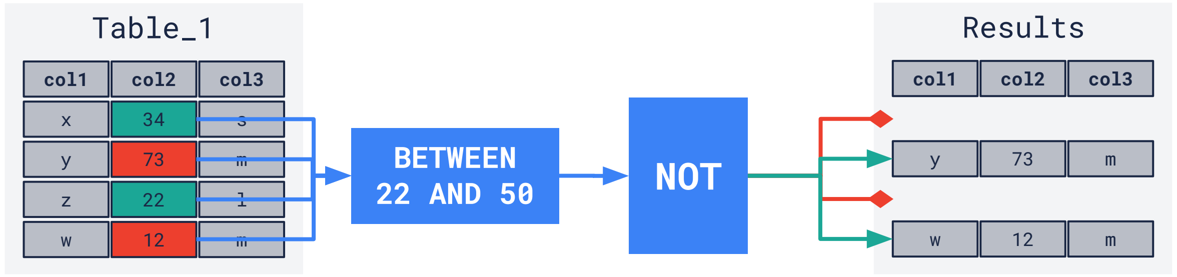
NULL values often create fallacies, so it is best to know about any **NULL** values in a column.

NOT and BETWEEN

NOT is used to negate a condition. **NOT BETWEEN**, for example, excludes a specific range of values.

Syntax: `… WHERE col NOT BETWEEN value1 AND value2;`

```
SELECT
    *
FROM
    db.Table_1
WHERE
    col2 NOT BETWEEN 22 AND 50;
```



- 34 and 22 both satisfy the **BETWEEN** condition, and **NOT** reverses the outcome, so 34 and 22 are now **FALSE**, and those rows are excluded.
- 12 and 73 evaluate to **FALSE** in the **BETWEEN** condition, and are reversed by **NOT** to **TRUE**, so those rows are **included**.

NOT complicates SQL logic, so the code becomes less readable. Use **NOT** sparingly.

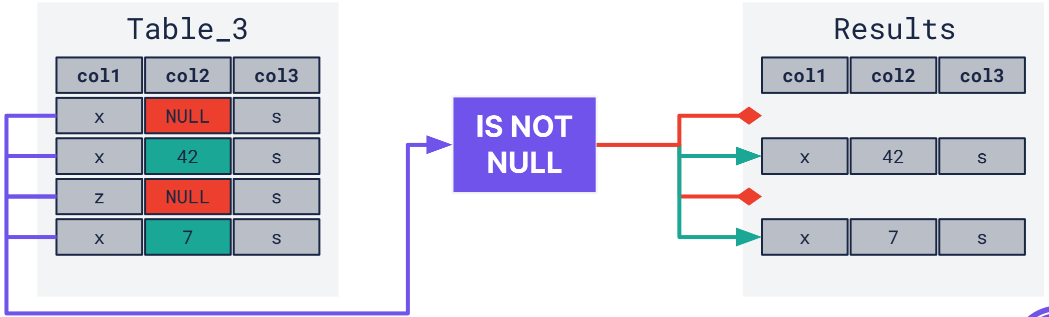
Logic operators

IS NOT NULL

The **`IS NOT NULL`** operator checks to see if a value is not null/empty, helping to confirm when data do indeed exist.

Syntax: `… WHERE col IS NOT NULL;`

```
SELECT
    *
FROM
    db.Table_3
WHERE
    col2 IS NOT NULL;
```



Includes only rows where there are **no `NULL`** values in the specified column.

We can use **`IS NOT NULL`** to remove any rows with missing data.

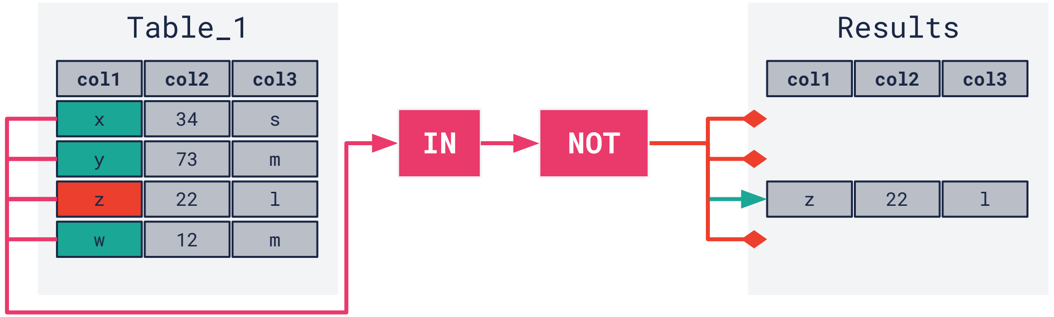
Logic operators

NOT and IN

NOT IN is used to ensure a value **does not** match any value in a list. The outcome of **IN** is reversed by **NOT**.

Syntax: `… WHERE col NOT IN (value1, value2, ...);`

```
SELECT
    *
FROM
    db.Table_1
WHERE
    col1
IN(
    “w”,
    “x”,
    “y”
);
```



- **NOT IN** reverses **IN**, so rows where `col1 = (w, x, y)` are **excluded**.
- `z` is **NOT IN** the list of options, so the row is **included**.

SQL text searching

Databases house an overwhelming amount of **text-based data**, including names, addresses, descriptions, and categories.

The **`LIKE`** operator in SQL is our key tool for navigating this textual labyrinth, allowing targeted **searches** within this data using **wildcards** to tune our searches.

For instance, a humanitarian aid worker could use it to quickly locate all NGOs with names that are related to water within a massive database using `LIKE`.

Searching text in SQL

> `LIKE` is used in a `WHERE` clause to **search** for a specified pattern in a **text-based** column. These patterns can be expressed using **wildcards**.

Wildcards are symbols that can represent any character(s) `(a-z, A-Z, 0-9)`, and even symbols, enabling a pattern-based search with the **`LIKE`** operator. There are two wildcards in SQL – underscore `(_)` and percentage `(%)`.

Underscore (_)

Represents **a single** character.

A search pattern like `h_t` will match with values like `hot`, `hat` and `hit`, but would not match with `heat` because `_` specifies a single character.

Percentage (%)

Represents **multiple** characters.

A search pattern like `South%` will match with values like `South Korea`, `South Africa`, `Southern`, or `Southern#1594` since it can represent any number of characters.

Wildcards

The **placement** of wildcards in the search pattern provides even more search flexibility.

`%` **at the end:** Matches any string starting with the given characters, for example, `p%` must **start** with `p`, be any length, and can end with any character.

`%` **at the start:** Matches any string ending with the given characters, for example, `%t` can start with any character, can be any length, but must **end** with `t`.

`_` **in place of one character:** Matches any **single** character in that position, for example, `_at` must contain **only three characters** and **end** with `t`.

	p%	%t	_at
car	FALSE	FALSE	FALSE
cat	FALSE	TRUE	TRUE
pet	TRUE	TRUE	FALSE
pat	TRUE	TRUE	TRUE
cart	FALSE	TRUE	FALSE

Wildcards

% inside: Matches any string that begins and ends with the given characters, and can be any length, for example, `c%t` must **start** with `c`, can contain any number of characters, and must **end** with `t`.

Wildcards can be combined:

_ at both ends: Matches any string containing the given characters, three characters long, for example, `_a_` must be **three characters long** and can start and end with **any** character, but **must have** an `a` in the middle.

% and _: Using both `%` and `_` we can limit strings further, for example, `_a%` matches with cat and cart. `_a%` can start with any single character that must be followed by an `a` and can end with any number of characters.

	c%t	_a_	_a%
car	FALSE	TRUE	TRUE
cat	TRUE	TRUE	TRUE
pet	FALSE	FALSE	FALSE
pat	FALSE	TRUE	TRUE
cart	TRUE	FALSE	TRUE

LIKE

> Only rows that **match** the `LIKE` search pattern (in the specified column) are **included** in the results.

Syntax: `… WHERE col LIKE “pattern + wildcard”;`

```
SELECT
    *
FROM
    db.Table_2
WHERE
    col1 LIKE “_a%”;
```

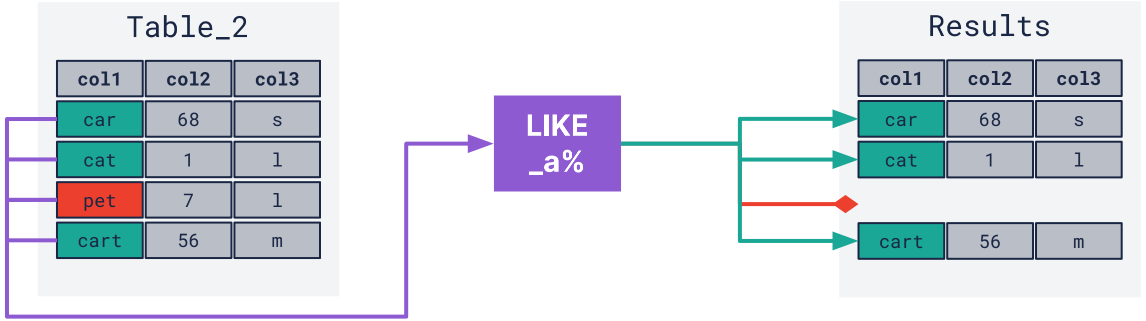


Table_2

col1	col2	col3
car	68	s
cat	1	l
pet	7	l
cart	56	m

Results

col1	col2	col3
car	68	s
cat	1	l
cart	56	m

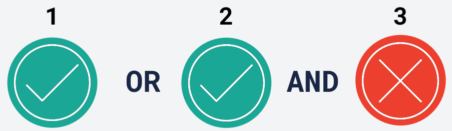
Only rows that **match** the search pattern (in the specified column) are **included** in the results.

- `pet` does not contain an `a`, so the row is **excluded**.
- `car`, `cat` and `cart` match `_a%` because `%` can be `r`, `t`, or `rt`.

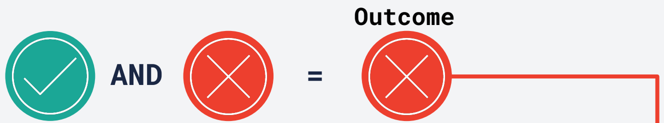
Order of operations

Operations in parentheses `()` are evaluated first, then **`AND`**, and lastly, **`OR`** is evaluated.

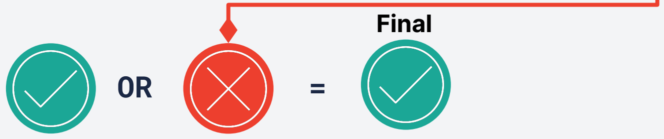
Suppose we have this combination of conditions:

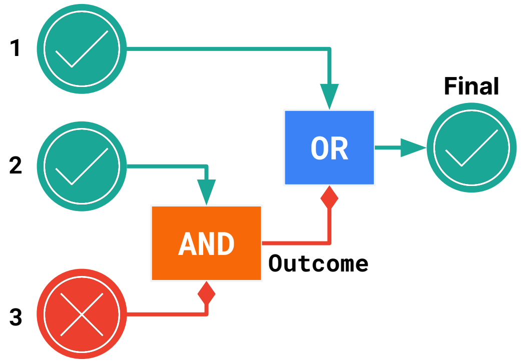


There are no `()`, so we evaluate **AND** first:



Then we evaluate **OR** using the outcome of **AND**:



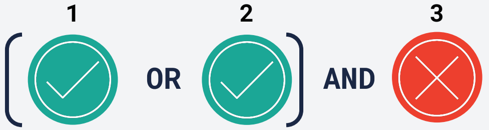


Keep the order of operations in mind when using **`AND`** and **`OR`** together.

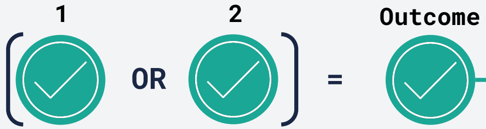
Order of operations

Parentheses ( ) can **interrupt** the order of operations.

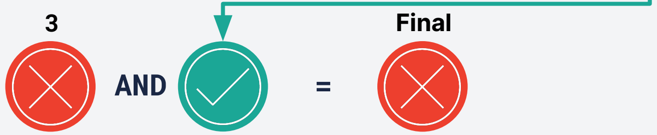
Suppose we have this combination of conditions:

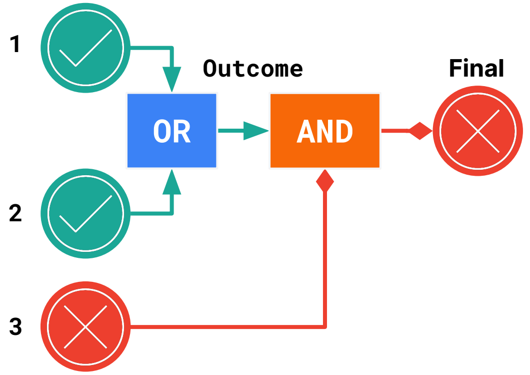


We evaluate the OR inside the ( ) first:



Then we evaluate AND using the outcome of OR:





By using parentheses, we can alter the order in which conditions are checked. Using this we **create complex logic** in SQL to search for data using **WHERE**.

Logic operators

Order of operations using WHERE

```
SELECT
    *
FROM
    db.Table_1
WHERE
    col1 = “w”
    OR col1 = “x”
    OR col1 = “y”
    OR col1 = “z”
    AND col2 > 20;
```

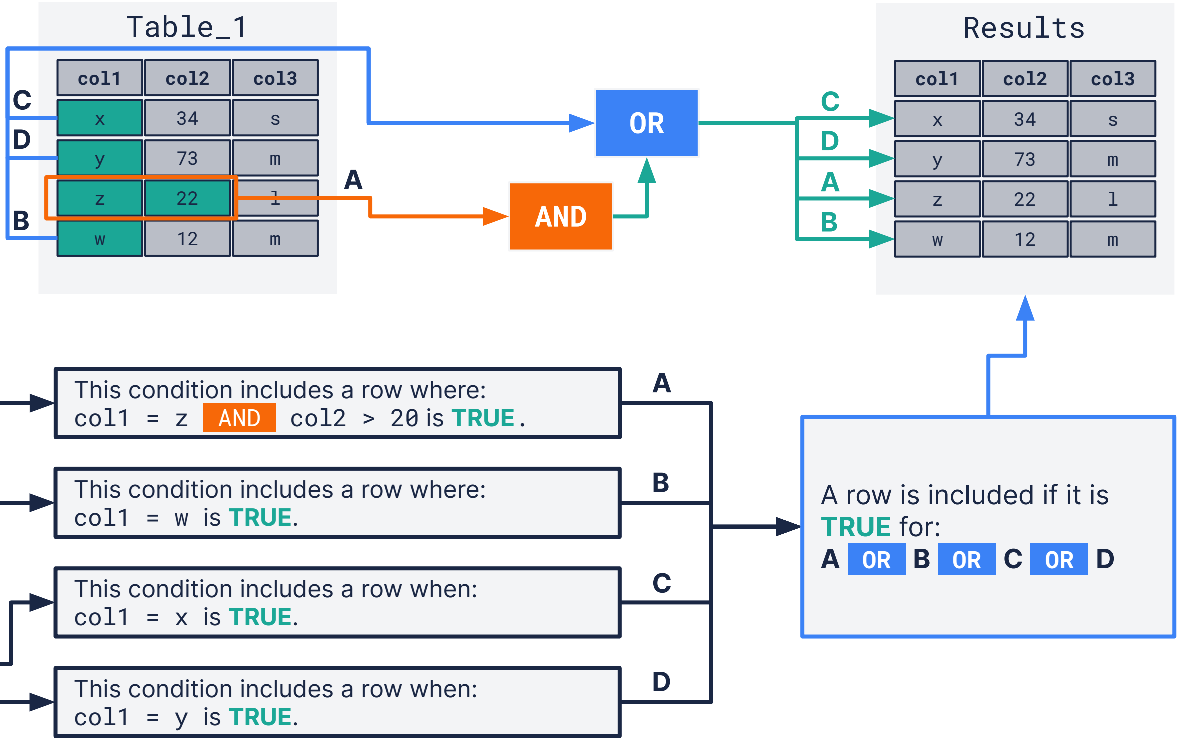


Table_1

col1	col2	col3
x	34	s
y	73	m
z	22	l
w	12	m

Results

col1	col2	col3
x	34	s
y	73	m
z	22	l
w	12	m

SQL will execute AND first, then OR, so the query that SQL executes is:

```
…
WHERE
    col1 = “z” AND col2 > 20
    OR col1 = “w”
    OR col1 = “x”
    OR col1 = “y”;
```

A: This condition includes a row where: col1 = z AND col2 > 20 is TRUE.

B: This condition includes a row where: col1 = w is TRUE.

C: This condition includes a row when: col1 = x is TRUE.

D: This condition includes a row when: col1 = y is TRUE.

A row is included if it is TRUE for: A OR B OR C OR D

Logic operators

Using parentheses with WHERE

```
SELECT
    *
FROM
    db.Table_1
WHERE (
    col1 = “w”
    OR col1 = “x”
    OR col1 = “y”
    OR col1 = “z”
    )
    AND col2 > 20;
```

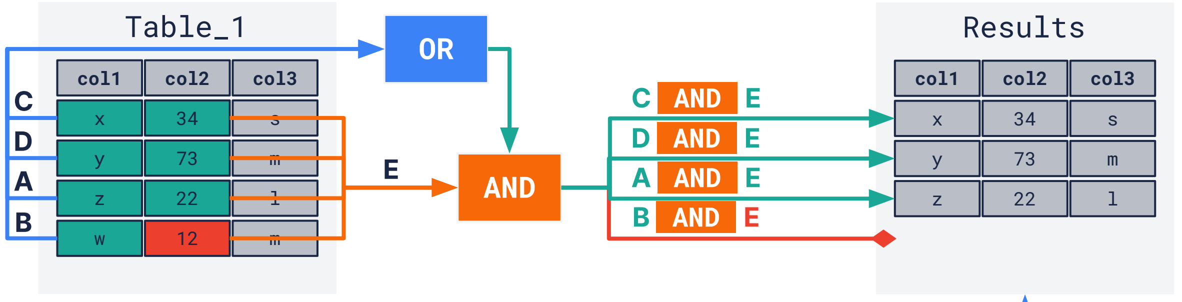


Table_1

col1	col2	col3
x	34	s
y	73	m
z	22	l
w	12	m

Results

col1	col2	col3
x	34	s
y	73	m
z	22	l

SQL will evaluate the contents of ( ) first, then AND :

```
…
WHERE
    (col1 = “z”
    OR col1 = “w”
    OR col1 = “x”
    OR col1 = “y”)
    AND col2 > 20 ;
```

A This condition includes a row where: `col1 = z` is TRUE .

B This condition includes a row where: `col1 = w` is TRUE.

C This condition includes a row when: `col1 = x` is TRUE.

D This condition includes a row when: `col1 = y` is TRUE.

E This condition includes a row when: `col2 > 20` is TRUE.

A row is only included if both: **(A, B, C, OR D)** are TRUE AND **E** is also TRUE.