# SQL Operators and Expressions

**Operators**

* **Logical Operators**
  + AND – joins two or more conditions, and returns results only when **all** of the conditions are true.
  + OR – joins two or more conditions, and returns results when **any** of the conditions are true.
  + NOT – negates the expression that follows it – a false condition evaluates as true and a true condition evaluates as false.
* **Ranges or Lists**
  + IN or NOT IN – finds results in/out of a non-consecutive group of values
  + BETWEEN or NOT BETWEEN – finds results that are within or outside of a consecutive group
* **Character Matching**
  + LIKE or NOT LIKE
  + Wildcards
    - **% -** Matches any string of zero or more characters, does not match a NULL.
    - **\_ (underscore) -** Matches any single character.
    - **[ ] (brackets) -** any single character within a specified range such as '**a**’to '**d**', inclusive [a-d] or a set of characters such as [aeiouy]
    - **[^] (not brackets)** any single character **not** in the specified range or set. (e.g., [^a-f])
  + **NOTE\*** Comparison operators (=, >, <, etc) cannot be used with wildcards.
* **Empty or Not Empty Cells**
  + IS NULL – finds blank cells
  + NOT NULL – finds cells that are not blank

**Expressions**

* Syntax: Expression “Name given column containing expression output”
* Basic expression operators:

| **SYMBOL** | **OPERATION** | **ORDER** |
| --- | --- | --- |
| \* | Multiplication | 1 |
| / | Division | 1 |
| + | Addition | 2 |
| - | Subtraction | 2 |

* Aggregate expression operators:
  + Can be used in the SELECT clause
  + Can be used in the HAVING clause
  + Cannot be used in the WHERE clause
  + SUM and AVG work with numeric data
  + MIN and MAX work with numeric, character, and date data
  + COUNT(\*) is used to count all the rows in a table, will include NULL values.
  + COUNT(column name) does almost the same thing. The difference is that you may define a specific column to be counted. Excludes NULL values.

| Function | Function Use |
| --- | --- |
| SUM ([ALL | DISTINCT] expression) | The total of the (distinct) values in a numeric column/expression. |
| AVG ([ALL | DISTINCT] expression) | The average of the (distinct) values in a numeric column/expression. |
| COUNT ([ALL | DISTINCT] expression) | The number of (distinct) non-NULL values in a column/expression. |
| COUNT (\*) | The number of selected rows. |
| MAX (expression) | The highest value in a column/expression. |
| MIN (expression) | The lowest value in a column/expression. |

* GROUP BY rules
  + If you have column name(s) AND aggregate function(s) in the SELECT clause, then you MUST also have a GROUP BY clause.
  + When a column name(s) is given in the SELECT clause, it must match a column name(s) listed in the GROUP BY clause.
  + A GROUP BY clause in a SELECT statement will determine the sort order of rows in a result table.
  + The sort order can be changed by specifying an ORDER BY clause after the GROUP BY clause.
* Filtering rows
  + The HAVING clause is to aggregate functions what the WHERE clause is for column names and expressions.
  + The HAVING and WHERE clauses do the same thing - filter rows from inclusion in a result table based on a condition.
  + A WHERE clause is used to filter rows **BEFORE** the GROUPING action.
  + A HAVING clause filters rows **AFTER** the GROUPING action.