3c. Structured Query Language - Built-in Functions
Built-In Functions

- **Functions** – an agent that you can use to finish a task so you don’t need to do it yourself.
- **Built-In functions** – The agent is already created for you by the database tool. You only need to know which agent to use and provide information needed to accomplish the task.
- **SQL built-in functions**
  - SUM
  - AVE
  - MAX
  - MIN
  - COUNT
SUM(fieldName): display the total of all the values in the field. The field must be a numeric type.

E.g. Show the total maximum hours of all the projects
SELECT SUM(MaxHours) 
FROM PROJECT;

E.g. Show the total hours worked by employee number 10
SELECT SUM(HoursWorked) 
FROM ASSIGNMENT 
WHERE EmployeeNumber = 10;

E.g. Show the total hours worked by employee number 10, but give a meaningful field name in the query
SELECT SUM(HoursWorked) AS TotalHours 
FROM ASSIGNMENT 
WHERE EmployeeNumber = 10;
Built-In Functions – AVG

- `AVG(fieldName)`: display the average of all the values in the field. The field must be a numeric type.
  - E.g. Show the average maximum hours of all the projects
    ```sql
    SELECT AVG(MaxHours) 
    FROM PROJECT;
    ```
  - E.g. Show the average hours worked by employee number 10
    ```sql
    SELECT AVG(HoursWorked) 
    FROM ASSIGNMENT 
    WHERE EmployeeNumber = 10;
    ```
  - E.g. Show the average hours worked by employee number 10, but give a meaningful field name in the query
    ```sql
    SELECT AVG(HoursWorked) AS AverageHours 
    FROM ASSIGNMENT 
    WHERE EmployeeNumber = 10;
    ```
Built-In Functions – MIN and MAX

- **MIN**(fieldName): display the smallest value of all the values in the field. The field must be a numeric type.
  - E.g. Show the smallest maximum hours of all the projects
    
    ```sql
    SELECT MIN(MaxHours)
    FROM PROJECT;
    ```
  - E.g. Show the highest hours worked from all the employees
    
    ```sql
    SELECT MAX(HoursWorked)
    FROM ASSIGNMENT;
    ```
Built-In Functions – COUNT

- **COUNT(*)**: count how many rows in total in a table
  - E.g. How many projects so far?
    ```sql
    SELECT COUNT(*)
    FROM PROJECT;
    ```
  - E.g. How many finished projects so far?
    ```sql
    SELECT COUNT(*)
    FROM PROJECT
    WHERE EndDate IS NOT NULL;
    ```
Built-In Functions – COUNT

- **COUNT**(Field\_Name): count how many values in that field, including duplicate values, **FieldName** doesn’t have to be numeric.
- E.g. How many department names in the project table?
  ```sql
  SELECT COUNT(department)
  FROM PROJECT;
  ```
- E.g. How many finished projects so far?
  ```sql
  SELECT COUNT(End\_Date)
  FROM PROJECT;
  ```
Embed Math Functions

- Standard math calculations can be done using SQL.
  - E.g. Show all the projects’ MaxHours and their cost if the cost is $18.5 per hour.
    ```sql
    SELECT ProjectID, ProjectName, MaxHours, MaxHours * 18.5 AS MaxProjectCost
    FROM PROJECT;
    ```
  - E.g. Show hours worked for all the employees and their wage if the pay is $9 dollars per hour.
    ```sql
    SELECT EmployeeNumber, HoursWorked, HoursWorked * 9 AS Wage
    FROM ASSIGNMENT;
    ```
  - E.g., Display a list of employee numbers with their hours worked, wage, bonus and total pay. Wage is calculated by hours worked times 10. Bonus is calculated by hours worked times 3. Total pay is the sum of wage and bonus.