This module will enable the learner to write SQL to display summarised data. Specifically the learner will be able to:

- Create summarised queries using aggregate functions: COUNT, MIN, MAX, SUM and AVG.
- Analyse data from single and multiple columns by using the GROUP BY clause.
- Filter the output of a summarised query by using the HAVING clause.

Code examples will be used to explain and demonstrate the content and for learners to imitate. Supporting exercises will provide practice opportunities. At the end of the module there is a short quiz to review the topic.

The next section covers the basics of aggregate functions.

COUNT / MIN / MAX / SUM / AVG

```
SELECT
    COUNT(*),
    COUNT(post_code),
    MIN(sales_target),
    MAX(sales_target),
    SUM(sales_target),
    AVG(sales_target)
FROM salesperson;
```

- **What does the SQL do?**
  - What is the difference between COUNT(*) and COUNT(post_code)?
  - What happens if there is a NULL value in the other Aggregate Functions?

The SQL selects all the records from the salesperson table and outputs a single result record using the aggregate functions.

- COUNT(*) displays the total number of records selected.
- COUNT(field) displays the total number of non-null values for the specified field from the records selected.
- MIN(field) displays the minimum non-null value for the specified field from the records selected.
- MAX(field) displays the maximum non-null value for the specified field from the records selected.
- SUM(field) displays the total of non-null values for the specified field from the records selected.
- AVG(field) displays the average of non-null values for the specified field from the records selected.

Aggregate Functions on Text Field

```
SELECT
    COUNT(post_code),
    MIN(post_code),
    MAX(post_code)
FROM salesperson;
```

- **What does the SQL do?**

Aggregate functions are generally used on numeric fields but can be used on text fields.

- COUNT displays the total number of non-null values for the specified field from the records selected regardless of whether that is a numeric or text field.
- MIN will display the first value in alphabetically order of the specified text field from the records selected.
- MAX will display the last value in alphabetically order of the specified text field from the records selected.
- SUM and AVG do not 'work' on text fields.

Subtotal of Single Column

```
SELECT
    emp_no,
    COUNT(*) AS 'No of Sales',
    MIN(order_value),
    MAX(order_value),
    SUM(order_value),
    AVG(order_value)
FROM sale
GROUP BY emp_no;
```

- **What does the SQL do?**
  - Note the field(s) in the GROUP BY need to be specified in the SELECT

The GROUP BY clause collects all the records selected by the specified field or fields. The aggregate functions then calculates the results based on the records for each unique value of the specified field or combinations of values if multiple fields are specified.
A record is output for each unique value or combination of values with the corresponding results.
Note the field or fields specified in the GROUP BY clause also need to be specified in the SELECT otherwise the SQL will fail.

Subtotal of Multiple Columns

```
SELECT
    company_no,
    emp_no,
    COUNT(*) AS 'No of Sales',
    MIN(order_value),
    MAX(order_value),
    SUM(order_value),
    AVG(order_value)
FROM sale
GROUP BY company_no,emp_no;
```

- **What does the SQL do?**

The GROUP BY clause can specify more than one field. Results are then calculated for each unique combination of the specified values for the records selected. Note that the SELECT specifies both the fields in the GROUP BY clause.

Subtotal of Multiple Tables and Columns

```
SELECT
    SP.dept_no,
    S.emp_no,
    COUNT(*) AS 'No of Sales',
    MIN(S.order_value),
    MAX(S.order_value),
    SUM(S.order_value),
    AVG(S.order_value)
FROM salesperson SP
JOIN sale S
ON SP.emp_no = S.emp_no
GROUP BY SP.dept_no,S.emp_no;
```

Aggregate functions can be used to calculate results based on multiple tables. The query is written like a standard JOIN with appropriate table aliases or names as prefixes to relevant fields. The fields used in the GROUP BY clause can be from different tables. Again these need to be duplicated in the SELECT.

Subtotal Filter Input

```
SELECT
    SP.dept_no,
    S.emp_no,
    COUNT(*) AS 'No of Sales',
    SUM(S.order_value)
FROM salesperson SP
JOIN sale S
ON SP.emp_no = S.emp_no
WHERE company_no = 3000
GROUP BY SP.dept_no, S.emp_no;
```

- **What does the SQL do?**
  - Modify to use other WHERE conditions

The WHERE clause can be used as in a standard query to filter the records that the calculations are based on. The aggregate functions and GROUP BY clause work exactly the same way but just on a reduced set of records.

Filter Results

```
SELECT
    emp_no,
    SUM(order_value)
FROM sale
GROUP BY emp_no
HAVING SUM(order_value) > 10;
```

- **What does the SQL do?**
  - Modify to use other Aggregate Functions

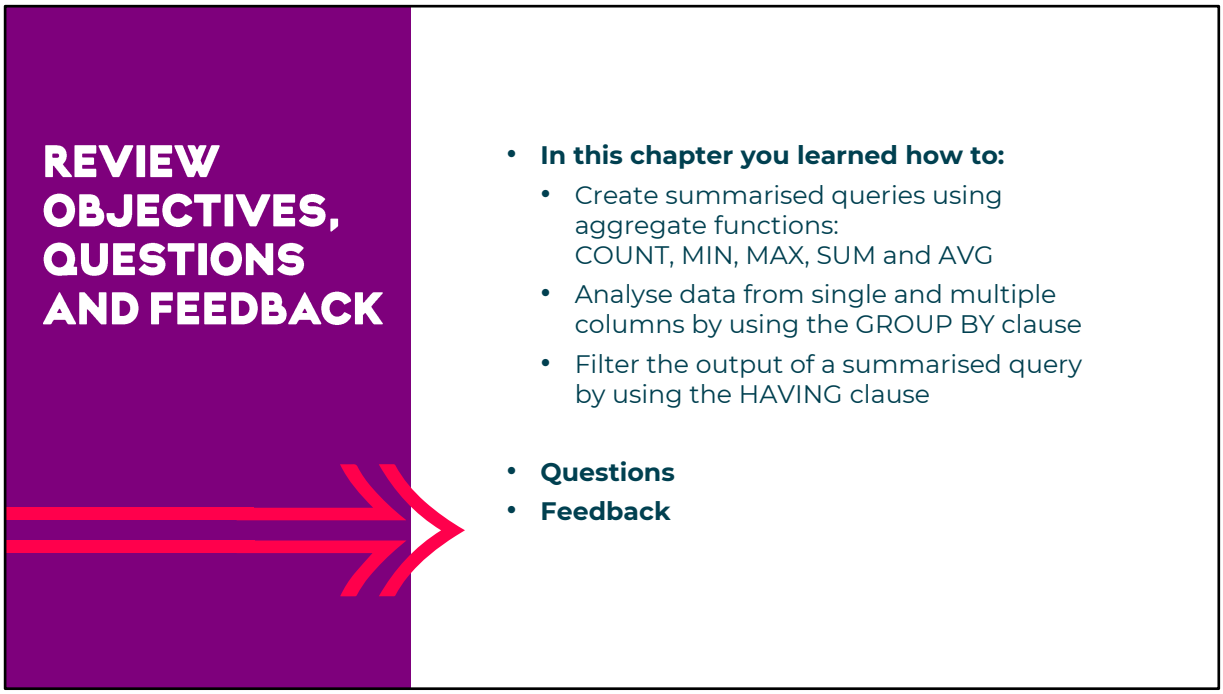
The HAVING clause can be added after the GROUP BY clause to filter the results calculated. The HAVING clause can contain an aggregate function. It does not need to be the same aggregate function as in the SELECT but generally it makes logical sense to do so.

Sorting Results

```
SELECT
    emp_no,
    SUM(order_value)
FROM sale
GROUP BY emp_no
HAVING SUM(order_value) > 10
ORDER BY SUM(order_value) DESC;
```

- **What does the SQL do?**
  - Modify to use other Aggregate Functions

Finally the results produced by an summarised query can be sorted using an ORDER BY clause as for a standard query. Again an aggregate functions can be included in the ORDER BY clause as one of the sort fields.



Have we achieved the Learning Outcomes for this module? As a learner can you:

- 5. Write SQL to display summarised data.

Also the Assessment Criteria? As a learner can you:

- 5.1 Create summarised queries using aggregate functions: COUNT, MIN, MAX, SUM and AVG
- 5.2 Analyse data from single and multiple columns by using the GROUP BY clause
- 5.3 Filter the output of a summarised query by using the HAVING clause

Do you have any further questions on the content covered or feedback on the module?


POWERING
POTENTIAL
Thank you