

Welcome

INTERMEDIATE SQL SERVER



Ginger Grant
Instructor

Course overview

- Chapter 1: Summarizing data
- Chapter 2: Date and math functions
- Chapter 3: Processing data with T-SQL [Transact SQL](#)
- Chapter 4: Window functions

Exploring Data with Aggregation

- Reviewing summarized values for each column is a common first step in analyzing data
- If the data exists in a database, fastest way to aggregate is to use SQL

Data Exploration with EconomicIndicators

```
SELECT Country, Year, InternetUse, GDP,  
       ExportGoodsPercent, CellPhonesper100  
FROM EconomicIndicators
```

```
+-----+-----+-----+-----+-----+  
|Country   |Year |InternetUse | GDP           |ExportGoodsPercent|CellPhonesper100 |  
+-----+-----+-----+-----+-----+  
|Swaziland |2011 |20.43165813 |7335004354    |56.30476059      |63.7015615      |  
|Sweden    |2011 |90.88204559 |394271163688  |49.93022195      |118.5711258     |  
|Switzerland|2011 |82.98773087 |395111518596  |51.20242546      |130.0623629     |  
...  
+-----+-----+-----+-----+-----+
```

Common summary statistics

- `MIN()` for the minimum value of a column
- `MAX()` for the maximum value of a column
- `AVG()` for the mean or average value of a column

Common summary statistics in T-SQL

This T-SQL query returns the aggregated values of column InternetUse

```
SELECT AVG(InternetUse) AS MeanInternetUse,  
MIN(InternetUse) AS MINInternet,  
MAX(InternetUse) AS MAXInternet  
FROM EconomicIndicators
```

T-SQL is by default case insensitive, so you don't have to write them in any particular case, but capitalizing keywords and function names is standard convention.

```
+-----+-----+-----+  
| MeanInternetUse | MINInternet | MAXInternet |  
|-----+-----+-----|  
| 18.9854496196171 | 0 | 375.5970064 |  
+-----+-----+-----+
```

Filtering Summary Data with WHERE

This T-SQL query filters the aggregated values using a WHERE clause

Notice the text value is in

```
SELECT AVG(InternetUse) AS MeanInternetUse,  
MIN(InternetUse) AS MINInternet,  
MAX(InternetUse) AS MAXInternet  
FROM EconomicIndicators  
WHERE Country = 'Solomon Islands'
```

```
+-----+-----+-----+  
|MeanInternetUse |MINInternet |  MAXInternet|  
|-----+-----+-----|  
|          1.79621|          0 |        6.00|  
+-----+-----+-----+
```

Subtotaling Aggregations into Groups with GROUP BY

```
SELECT Country, AVG(InternetUse) AS MeanInternetUse,  
MIN(InternetUse) AS MINInternet,  
MAX(InternetUse) AS MAXInternet  
FROM EconomicIndicators  
GROUP BY Country
```

```
+-----+-----+-----+-----+  
| Country          | MeanInternetUse | MINInternet | MAXInternet |  
+-----+-----+-----+-----+  
| Solomon Islands  | 1.79621         | 0           | 6.00        |  
| Hong Kong        | 245.1067        | 0           | 375.00      |  
| Liechtenstein    | 63.8821         | 36.5152    | 85.00       |  
| ...              |                  |             |             |  
+-----+-----+-----+-----+
```


HAVING is the WHERE for Aggregations

Cannot use `WHERE` with `GROUP BY` as it will give you an error

```
-- This throws an error
...
GROUP BY
WHERE Max(InternetUse) > 100
```

Instead, use `HAVING`

```
-- This is how you filter with a GROUP BY
...
GROUP BY
HAVING Max(InternetUse) > 100
```

HAVING is the WHERE for Aggregations

```
SELECT Country, AVG(InternetUse) AS MeanInternetUse,  
MIN(GDP) AS SmallestGDP,  
MAX(InternetUse) AS MAXInternetUse  
FROM EconomicIndicators  
GROUP BY Country  
HAVING MAX(InternetUse) > 100
```

```
+-----+-----+-----+-----+  
|Country      |MeanInternetUse  |SmallestGDP  | MAXInternetUse|  
|-----+-----+-----+-----|  
|Macedonia    | 71.3060150792857| -0.465059948| 110.5679538|  
|Hong Kong    | 245.106718614286| 0| 375.5970064|  
|Congo        | 60.8972476010714| -9.492757847| 104.6455529|  
...  
+-----+-----+-----+-----+
```

Examining UFO Data in the Incidents Table

- The exercise will explore data gathered from Mutual UFO Network
- UFO spotted all over the world are contained in the Incidents Table

Let's practice!

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Finding and Resolving Missing Data

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Detecting missing values

- When you have no data, the empty database field contains the word `NULL`
- Because `NULL` is not a number, it is not possible to use `=` , `<` , or `>` to find or compare missing values
- To determine if a column contains a `NULL` value, use `IS NULL` and `IS NOT NULL`

Returning No NULL Values in T-SQL

```
SELECT Country, InternetUse, Year
FROM EconomicIndicators
WHERE InternetUse IS NOT NULL
```

```
+-----+-----+-----+
|Country          |InternetUse      |Year          |
+-----+-----+-----+
|Afghanistan      |4.58066992       |2011          |
|Albania           |49               |2011          |
|Algeria           |14               |2011          |
....
+-----+-----+-----+
```

Detecting NULLs in T-SQL

```
SELECT Country, InternetUse, Year
FROM EconomicIndicators
WHERE InternetUse IS NULL
```

```
+-----+-----+-----+
|Country      |InternetUse    |Year      |
+-----+-----+-----+
|Angola       |NULL          |2013      |
|Argentina    |NULL          |2013      |
|Armenia      |NULL          |2013      |
|. . . . .
+-----+-----+-----+
```


Blank is not NULL

- A blank is not the same as a NULL value
- May show up in columns containing text
- An empty string `' '` can be used to find blank values
- The best way is to look for a column where the Length or `LEN > 0`

Blank is not NULL

```
SELECT Country, GDP, Year
FROM EconomicIndicators
WHERE LEN(GDP) > 0
```

```
+-----+-----+-----+
|Country          |GDP              |Year          |
|-----+-----+-----+
|Afghanistan      |54852215624      |2011          |
|Albania          |29334492905      |2011          |
|Algeria          |453558093404     |2011          |
|. . . .
+-----+-----+-----+
```

Substituting missing data with a specific value using ISNULL

```
SELECT GDP, Country,  
ISNULL(Country, 'Unknown') AS NewCountry  
FROM EconomicIndicators
```

```
+-----+-----+-----+  
| GDP           | Country       | NewCountry    |  
+-----+-----+-----+  
| 5867920022    | NULL          | Unknown       |  
| 597873038497  | South Africa  | South Africa  |  
| 1474091271101 | NULL          | Unknown       |  
| ...           |               |               |  
+-----+-----+-----+
```

Substituting missing data with a column using ISNULL

```
/*Substituting values from one column for another with ISNULL*/  
SELECT TradeGDPPercent, ImportGoodPercent,  
ISNULL(TradeGDPPercent, ImportGoodPercent) AS NewPercent  
FROM EconomicIndicators
```

```
+-----+-----+-----+  
|TradeGDPPercent |ImportGoodPercent |NewPercent |  
|-----+-----+-----+  
|NULL           |56.7              |56.7       |  
|52.18720739    |51.75273421      |52.18720739|  
|NULL           |NULL              |NULL       |  
... 
```

Substituting NULL values using COALESCE

COALESCE returns the first non-missing value

```
COALESCE( value_1, value_2, value_3, ... value_n )
```

- If `value_1` is `NULL` and `value_2` is not `NULL`, return `value_2`
- If `value_1` and `value_2` are `NULL` and `value_3` is not `NULL`, return `value_3`
- ...

SQL Statement using COALESCE

```
SELECT TradeGDPPercent, ImportGoodPercent,  
COALESCE(TradeGDPPercent, ImportGoodPercent, 'N/A') AS NewPercent  
FROM EconomicIndicators
```

TradeGDPPercent	ImportGoodPercent	NewPercent
NULL	56.7	56.7
NULL	NULL	N/A
52.18720739	51.75273421	52.18720739

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Binning Data with Case

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Changing column values with CASE

```
CASE
  WHEN Boolean_expression THEN result_expression [ ...n ]
  [ ELSE else_result_expression ]
END
```

Changing column values with CASE in T-SQL

```
SELECT Continent,  
CASE WHEN Continent = 'Europe' or Continent = 'Asia' THEN 'Eurasia'  
      ELSE 'Other'  
      END AS NewContinent  
FROM EconomicIndicators
```

```
+-----+-----+  
|Continent|NewContinent|  
+-----+-----+  
|Europe   |Eurasia     |  
|Asia     |Eurasia     |  
|Americas |Other       |  
...  
+-----+-----+
```

Changing column values with CASE in T-SQL

```
SELECT Continent,  
CASE WHEN Continent = 'Europe' or Continent = 'Asia' THEN 'Eurasia'  
      ELSE Continent  
      END AS NewContinent  
FROM EconomicIndicators
```

```
+-----+-----+  
|Continent|NewContinent|  
+-----+-----+  
|Europe   |Eurasia     |  
|Asia     |Eurasia     |  
|Americas |Americas    |  
...  
+-----+-----+
```

Using CASE statements to create value groups

```
-- We are binning the data here into discrete groups
SELECT Country, LifeExp,
CASE WHEN LifeExp < 30 THEN 1
      WHEN LifeExp > 29 AND LifeExp < 40 THEN 2
      WHEN LifeExp > 39 AND LifeExp < 50 THEN 3
      WHEN LifeExp > 49 AND LifeExp < 60 THEN 4
      ELSE 5
END AS LifeExpGroup
FROM EconomicIndicators
WHERE Year = 2007
```

```
+-----+-----+
|LifeExp |LifeExpGroup |
+-----+-----+
|25      |1            |
|30      |2            |
|65      |5            |
...
+-----+-----+
```

Let's practice!

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